STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WASTE MANAGEMENT
1646 MAIL SERVICE CENTER
RALEIGH, N.C. 27699

Earth Farms, LLC

is hereby issued a permit to operate a

LARGE, TYPE 3 SOLID WASTE COMPOST FACILITY

at 351 Colt Thornburg Road in Gaston County

Permit Number: SWC-36-13

in accordance with Article 9, Chapter 130A, of the General Statutes of North Carolina and all rules promulgated thereunder and subject to the conditions set forth in this permit.

8/12/10
Date

Michael E. Scott, Branch Head
Solid Waste Section

Permit Conditions:

1. Operation and maintenance of this facility shall be in accordance with the Solid Waste Compost Rules (15A NCAC 13B, Section .1400), the Permit Application and the Operation and Maintenance Manual submitted with the permit application, and these permit conditions. Failure to comply may result in compliance actions or permit revocation by the Division of Waste Management.

2. This facility shall be operated in such a manner that erosion and runoff from the site shall be controlled. Any leachate generated at the facility and any runoff from the facility shall be managed in such a manner that ground or surface water quality will not be adversely affected. Additional permits will be required to land apply any wastewater generated at the facility. The facility shall be maintained to prevent the accumulation of stormwater or leachate on travel areas or active composting sites.

3. An appropriate Division of Water Quality permit for managing any stormwater or wastewater on the facility shall be maintained if required.

4. Only materials specifically listed in the permit application may be managed at this facility. Before additional materials may be added, there must be adequate testing and prior approval by the Division of Waste Management in writing.

5. All compost produced at the facility shall meet the requirements of Rule .1407 of the Solid Waste Compost Rules and the permit application.

6. Testing and reporting shall be conducted in accordance with the requirements of Rule .1408 and the permit application. An annual report of facility activities for the fiscal year July 1 to June 30 shall be submitted to the Division by August 1 of each year on forms provided by the Division. This report shall include the amount of materials composted in tons.

7. The compost operation and the compost pad shall be operated and maintained with sufficient dust control measures to minimize airborne emissions and to prevent dust from becoming a nuisance or safety hazard.

8. Windrow data shall be maintained in writing as required to document temperatures, moisture levels and turning intervals. Bulk density and C:N calculations shall be reviewed no less than every 14 days.

9. Earth Farms, LLC shall ensure that windrow moisture levels in the compost

windrows are maintained in the 40-60% range for newly created windrows and compost windrows within PFRP.

10. Windrow dimensions for active composting shall be limited to a maximum of 7' high x 20' wide unless otherwise approved by the Division.

11. Windrow turning shall not occur without consulting weather forecasts for favorable conditions including temperature, wind direction, temperature inversions, and precipitation.

12. The odor management plan shall be followed to minimize odors at the facility boundary. Upon receipt of a facility complaint the facility operator shall investigate and take action as necessary to minimize the cause of the complaint. A copy of all complaints regarding this facility shall be maintained for the duration of the permit including the operator's actions taken to resolve the complaints.

13. Feedstocks shall not be received that are in an anaerobic state.

14. The facility shall be operated in a manner that reduces the potential for vector attraction.

15. Stockpiling of finished product shall be limited to a height of 60'.

16. The facility operational capacity for this permit shall be limited to 30,000 tons of feedstocks per year received for composting.

17. This permit shall expire on August 12, 2015. Changes in ownership, increase in facility capacity, or receiving feed stocks not identified in the permit application shall require a permit modification.

NCDENR
North Carolina Department of Environment and Natural Resources
Division of Waste Management
Dexter R. Matthews
Director

Beverly Eaves Perdue
Governor

Dee Freeman
Secretary

August 12, 2010

Mr. Jim Lanier
Earth Farms, LLC
PO Box 184
Stanley, NC 28164

Re: Solid Waste Compost Permit SWC-36-13

Dear Mr. Lanier:

Enclosed is your permit to operate a Large, Type 3 Solid Waste Compost Facility in Dallas, North Carolina. Please carefully read all permit conditions. The operation manual submitted with your application has been incorporated into your permit. Your permit number is SWC-36-13. The permit expiration date is August 12, 2015.

Mr. Charles Gerstell, Environmental Senior Specialist, will be responsible for facility inspections. Mr. Gerstell can be contacted at 704-235-2144. If you have any questions please feel free to contact our staff engineer Mr. Zi-Qiang Chen, Ph.D. at 919-508-8523, or myself at 919-508-8508.

Sincerely,

Michael E. Scott, Supervisor
Composting & Land Application Branch

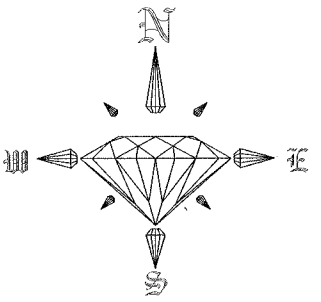
cc: Charles Gerstell, Environmental Senior Specialist, DWM
Zi-Qiang Chen, Ph.D., Composting & Land Application Branch
Central File, Solid Waste Section, Division of Waste Management

1646 Mail Service Center, Raleigh, North Carolina 27699-1646
Phone: 919-508-8400 \ FAX: 919-733-4810 \ Internet: www.wastenotnc.org

EARTH FARMS COMPOST SITE APPLICATION

For

LARGE TYPE III FACILITY



DIAMOND ENGINEERING, PLLC
440 OLD NC 277 LOOP ROAD
DALLAS, NC 28034
PHONE: 704-922-0024

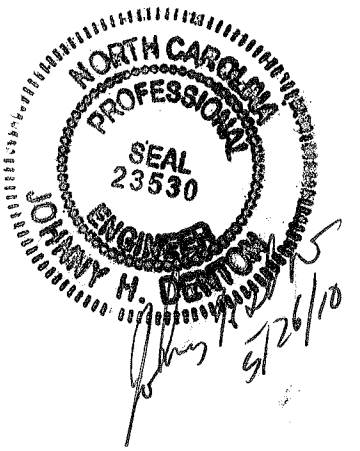
Developed by:

Johnny H. Denton, PE, PLS & Kimberly Fortner, Diamond Engineering, PLLC
A.R. Rubin, Professor Emeritus, NCSU-BAE

For:

Earth Farms, LLC
351 Colt Thornburg Road
Dallas, NC 28034

January 22, 2010
Revised May 26, 2010



Materials Contained herein are derived from North Carolina Administrative Code (NCAC) and the compost requirements contained in 15 A NCAC 13B 1400 et seq.

A. Site Location (.1405 (b)(1))

The Earth Farms, LLC Compost Facility is located at 351 Colt Thornburg Road in Gaston County, NC. The site is located between Colt Thornburg Road and the Catawba River. The location of the compost facility is shown on a site map and aerial photographic maps included in Attachment 1. The Earth Farms, LLC Compost Site is located so as to meet or exceed all the applicable buffers for a Large Type 3 composting facility posed in NC Rule. The applicable buffers are shown on the site map provided in Attachment 1.

The application for the compost site permit does not include the septage and grease trap operation. These activities have been ongoing as a part of a pre-existing, permitted septage operation.

B. Letter from Gaston County Planning (1405(a)(2))

The Gaston County Zoning letter is included in Attachment 5

C. Compliance: (.1405(b)(3) and .1404 (a)

(1) The Earth Farms Site is located on a terrace landscape position adjacent to the South Fork River. Portions of the property located in designated floodplain areas are not intended to host compost operations.
(2) The site map attached identifies property boundaries and demonstrates compliance with mandated buffer requirements.
(3) The site map attached indicates adequate buffer between site operations and adjacent residences or dwellings.
(4) The site map attached indicates adequate buffer between site operations and wells.
(5) The site map attached indicates adequate buffer between compost operations and waterways.
(6) There is no direct discharge of pollutants from the site, water quality standards apply to discharge systems; non-point sources of discharge have been addressed through the operations plan.
(7) No portion of the operation is located over a closed solid waste operation.
(8) No portion of the operation is located within 25 feet of a berm or swale.
(9) No discharge of pollutants will impact section 404 waters or areas or violate water quality standards.
(10) Site assessments confirm no groundwater within 24 inches of soil surface.

Compliance: 1404(b)

1. Not applicable

Compliance: .1404(c)

1. Access to the site is controlled at locked gate along Colt Thornburg Road
2. Sediment control practices are in place and practiced
3. Air emissions are controlled by turning appropriately and maintaining required buffers
4. Odor emissions are controlled by managing compost turning operations

D. Operational Details:

1. Waste types: The compost is manufactured from a mixture of hardwood sawdust, animal bedding, ground corn cobs, ground yard waste, FOG wastes (dewatered grease trap residuals), construction debris (clean, unfinished wallboard, wood pallets where nails can be removed, clean wood scrap from construction operations), pre and post consumer, source controlled food wastes, vegetative agricultural/agribusiness wastes such as wet, indigestible hay or forage, corn stover, cotton gin trash, or peanut hulls, and land clearing debris material. See Attachment 2 for quantities.

2. Site assessment: evaluations indicate seasonal groundwater elevations at a depth of over 24 inches.

E. Site Plan: Site plan is attached, see Attachment 1

F. Compost Facility Permittee

(1) Mr. Jim Lanier of 131 Mariposa Road, Stanley, NC 28164 is the Permittee for this facility. He can be reached at 704-263-8186 (office) or 704-860-5534 (cell). Personnel involved in the compost operation are:

Facility Manager

Job Description:

- Daily supervision of staff
- Inspect facility daily
- Check temperature of windrows
- Operate Bachus Windrow Turner
- Responsible for compost recipes
- Responsible for all record keeping and testing according to the facility permit
- Prepare yearly budget
- Manage all equipment operations and repairs with mechanic

Loader Operator

Job Description:

- Mix feed stock and transport to windrows
- Routine equipment maintenance daily (check fluid and grease)
- Take up windrows
- Screen finished compost
- Load product going to market

Plant Operator

Job Description:

- Operate dewatering box
- Assist in recipe of feed stocks
- Assist in equipment maintenance

Equipment Operator

Job Description:

- Operate pump truck applying water to windrows
- Drive tractor and trailer hauling feed stock
- Haul finished product to market
- Assist Manager

(2) Operations Schedule: The Earth Farms compost operation will be open from 7:00 am through 7:00 P.M. Monday through Saturday. These operating hours will accommodate inflow and operation, and may be less than reported here. Upon completion of a typical work day, the compost windrows will be checked to assure proper cover and the gate will be closed and locked.

(3) HHW – Household Hazardous Waste are not composted at the site. If received on the site, they will be removed and handled through approved HHW operations.

(4) Special precautions: during inclement weather (excessive rain, severe winds, snow, ice, or weather warning associated with tornado or hurricane), the facility will not actively mix or blend materials. Compost windrow turning may proceed if site and soil conditions permit.

(5) Vector and nuisance conditions will be addressed by maintaining proper cover over windrows to prevent vector attraction. Noise associated with equipment operations will

be controlled by operating only during posted hours of operation, no Sunday operation, and by controlling vehicle speed along Colt Thornburg Road. Dust control if needed will be achieved by wetting roadways and other surfaces generating dust.

(6) Finished compost will be utilized as a component of bioretention mix in stormwater systems, as a medium for plant growth, as a landscape material and for agricultural, horticultural, or silvicultural substrate. All compost materials will be certified as PFRP and representative samples of the material will be tested as accomplished by NCDA for organic matter, nutrient, regulated metal, and salt levels.

An operations and maintenance manual is provided. The Operations manual lists activities of individuals involved, operational requirements during normal operations and adverse weather, turning frequencies, temperature monitoring requirements, product quality testing and disposition for the compost.

G. Compost Facility Design

(1) The Earth Farms, LLC Compost Facility consists of a series of gravel, concrete and compacted soil pads each of varying size. The site contains several distinct areas. These are:

Area or bay 1 – material receiving
Area or bay 2 – material processing and dewatering area
Area or bay 3 – material curing and VAR compliance area
Area or bay 4 – PFRP compliance area
Area or bay 5 - Outside storage – areas suited for storing finished compost or dry feedstock materials

In addition to these defined areas, the site also contains tanks for storage and treatment of the raw materials to be processed and composted. These consist of above ground tanks ranging from 6500 to 10000 gallons capacity, a dewatering box and other infrastructure permitted as a part of the on-going septage and grease trap waste management program.

The compost is manufactured from a mixture of hardwood and softwood chips and sawdust, animal bedding, ground corn cobs, ground yard waste, FOG wastes (dewatered grease trap residuals), construction debris (clean, unfinished wallboard and construction debris such as saw wood or pallets), pre and post consumer, source controlled food wastes, vegetative agricultural/agribusiness wastes such as wet, indigestible hay or forage, corn stover, cotton gin trash, or peanut hulls, and land clearing debris material.

All of the putrescible material is mixed and blended with a suitable substrate on the concrete pad on the day of arrival to prevent nuisance problems. On day of arrival, the non-putrescible materials are stored in the raw material storage areas for subsequent use

as needed for staging purposes. Raw feedstock materials are initially mixed and blended on the concrete pad using a front-end-loader. A mixer with a feed auger is used to combine the blended raw materials, which are then placed into the windrow compost production area. The windrow compost process continues in these open windrows for approximately 30 days from placement to product. At the end of the composting process, the PFRP/VAR compliant compost is moved by a loader and conveyor onto the finished compost storage pad for curing. The finished compost is to be stored for a period of not less than120 days and not to exceed 180 days for curing. A portion of the finished compost may be sold in bulk as a soil amendment, but the majority will be blended with topsoil or sand marketed as finish compost or bio-retention blend.

The facility is intended to accommodate up to 30,000 tons per year of compostable materials. These materials will be received on a varying schedule and daily receipts may exceed 100 tons, while annual processing will not exceed 30,000 tons. Compost mixes or blends will be developed each day based on incoming feedstocks and ultimate market opportunity. Coarse materials will be used to produce silvicultural product while the finer textured materials will be mixed and blended for the horticulture and bioretention blend markets.

2. Compost Recipes

The exact blends and mixtures are developed based on proprietary mixes and blends developed by Earth Farms, LLC, for specific end uses. The compost is made from a mixture of hardwood sawdust and animal bedding from livestock operations, untreated wallboard and other untreated construction debris, land clearing debris, yard and leaf waste, dewatered grease trap wastes and vegetative wastes from food operations. The ground yard waste, ground corn cobs and land clearing debris material are may be incorporated into the compost recipes to increase levels of solids and decrease moisture levels. Table 1 shows the characteristics of the raw materials used for compost mixture calculations.

Table 1. `Raw Material Characteristics

Raw Material[1]	% N	C:N Ratio	% Moisture Content
Septage	1.0	40:1	95
Dewatered Grease Trap	1.0	60:1	70
Hardwood Sawdust	0.09	560	10
Sawdust Bedding	0.24	442	20
Ground Corn Cobs	.6	98	15
Animal Bedding	.5	120	40
Ground Yard Waste	.9	54	40
Land Clearing Debris	.09	560	5
Food waste	1	30	95

[1]Nitrogen and Carbon Information based on data from "On-Farm Composting Handbook"

The composting operation serves primarily to receive septage and dewatered grease trap wastes in order to reduce the hydraulic loads into the land treatment operation permitted on the site. The mixtures of substrate and waste should result in an initial C:N ratio of ~30:1 and a moisture content of ~75%.

3. Availability of Raw Materials Protocol for Compost

The waste production assumptions for the compost operation are as follows:

a. 10-20 dry tons/day grease trap waste processed 5 days per week
b. 2.5 dry tons/day of septage processed 5 days per week
c. 60 tons of food & vegetative waste per day received
d. 15 tons per day feedstock from municipal, commercial and industrial sources. This volume will vary, but total production from all sources will not exceed 30,000 tons annually. Should production quotas increase, a permit modification will be requested.

The solids portion of the processed liquid waste is to be composted. The liquid will be accommodated through land application or transport to a separate, permitted facility. In addition to the nitrogen sources available from the septage and dewatered grease trap waste, several sources of carboniferous bulking materials are readily available for

utilization in the composting process. These materials include hardwood sawdust from a local furniture manufacturing plant, mixed wood chips and sawdust from ground pallets (nail free), animal transport bedding materials from livestock operations, straw bedding material from the on-site free-stall dairy, horse, or cattle barns, poultry litter from local poultry growers, untreated wallboard from home construction/manufacture, pre and post consumer food waste and hay/straw harvested form the land application fields.

4. Flow Diagram

The composting process at the Earth Farms Compost Facility is depicted on the site plan showing the processing area, the concrete mixing pad, the compost production windrows, the curing area and the screening/mixing area and may described as follows: dry raw materials such as sawdust, wood chips, bedding material and ground pallet materials (wooden pallets) are received and stored prior to use in the "dry material" storage areas. These materials are combined with a daily delivery of wet raw materials and the dewatered materials generated on-site. The dry materials are placed directly onto the pad and the wet or processed septage/grease trap materials are placed over the top of the material, these materials are mixed and blended using a loader in an approximate 50/50 ratio. These raw feedstock materials are loaded via loader into the bulk mixer. The proper ratio of material introduced onto the mixing pad is determined by the number of "buckets" of material placed by the loader. The bulk mixing operation thoroughly combines the raw material and "mixed" raw materials are transferred to the compost production area. After initial treatment in the compost windrows for PFRP and VAR compliance, the compost is removed to the initial storage area, where it is allowed to complete the compost curing process.

A process flow diagram, showing the equipment and flow of materials through the composting system is included in Attachment 2. The critical flow duration in the active windrow is 15 days at required temperature with 5 consecutive turnings as required in rule. Typical time in a active windrow will be 4 to 6 weeks to allow for temperature rise from ambient to thermophilic. Mixing and blending will be accomplished in a 24 to 48 hour duration while curing and storage may require between 2 and 3 months depending on end use.

5. Leachate Collection and Recycle System

The site plan indicates that compost production areas/pads are sloped toward a runoff collection area. Excess runoff will be returned to the compost windrow areas as liquid or transported off site to the Cramerton Wastewater facility. Contents of the collection area or shallow basin are removed as needed and are normally incorporated back into compost batch as a liquid and nitrogen source or are allowed to evaporate. Any addition of leachate back to the windrow is carried out in the primary loading of the windrow and results in an additional full processing and heat cycle which results in the Process to

Further Reduce Pathogens (PFRP) to be repeated. In very wet conditions or in an emergency, such as a sustained power outage or equipment breakdown, the collected leachate will be transferred to the nearby wastewater treatment facility in Cramerton, NC.

6. Preliminary Compost Analysis/Quality

Detailed compost characterizations have been performed previously by NCDA on several samples of the finished compost. All units in the analysis are measured on a dry weight basis (mg/kg). Table 3 shows a summary of the results from NCDA sampling. The finished compost does not have any measurable concentration of regulated or heavy metals. The hardwood sawdust utilized in the recipes comes from a hardwood furniture manufacturing, and does not include wood treated with preservatives which contain copper, chromate or arsenic (CCA). The remaining raw material sources are primarily agricultural in nature and do not have significant heavy metal concentrations.

7. Pathogen Reduction Verification

Pathogens are to be reduced as required in the NC Solid Waste Compost Rules, Section .1406. The Earth Farms Facility shall maintain the compost process at or above 55 degrees C (131 degrees F) for fifteen (15) days with at least five turning events. (This satisfies PFRP and VAR requirements).

The completed compost from the Earth Farms Compost Facility will have a fecal coliform density of less than 1000 colonies Most Probable Number (MPN) per gram of dry solids. The materials will demonstrate pathogen reduction requirements by process monitoring (time and temperature).

8. Protocol for Compost which does not meet Pathogen Reduction Level

All finished compost which does not meet the time temperature requirements listed in rule(131 degrees F for 15 days) or tested fecal coliform level of 1,000 colonies per gram of dry material are to be returned to the windrow and subjected to an additional, high heat cycle (up to 131 degrees Fahrenheit for 15 or more days). In the event that this process does not reduce the fecal coliform count or the manager/operator decides that the additional composting is of no value, then the material will be land applied to an appropriate, permitted off-site disposal area (permitted for class B material through NCDWQ or NCDWM) or transported to a permitted landfill.

9. Contingency Plans for the Operation

An operating manual detailing the composting facility operations and procedures, including recipes, equipment, monitoring, maintenance, and record keeping is included as Attachment 4.

Contingency plans for operation in the event of equipment breakdown, temporary power

failure, or inclement weather, essential operations will be accomplished with alternative equipment; for example, if turning is required and the turner is inoperable, turning will be accomplished with front end loader.

Problems with operation of the composting facility during extreme weather conditions such as heavy rain or high winds will be minimized because of limited ingress to the site. None the less, essential operations will be accomplished as required with equipment available.

In freezing conditions, it may be necessary to modify the compost cycle to assure temperatures are maintained adequately. This may requires turning during late morning and early afternoon hours to take advantage of warmer day-time temperatures. This practice should allow the temperature to reach and maintain the desired level in excess of 131 degrees Fahrenheit for at least 15 days with the required turnings to meet the PFRP requirements. Special caution will need to be taken with the operation of skid loader equipment in any areas where the small amount of leachate could freeze and present a slippage hazard. Operators will be trained in proper operation of all equipment to assure a safe and sound operation.

10. Compost Equipment

Bachus Windrow Turner

Use:

- Turn windrows

Cat IT28 Rubber Tired Loader (3 cubic yard capacity)

Use:

- Mix feed stock and load truck to transport to windrow
- Top dress windrows
- Transport compost to curing pile
- Load product on trucks to be transported to market

Mack Roll Off Truck

Use:

- Transport compost mix to windrows
- Transport feed stock around facility
- Run food waste route and pick up food waste from clients
- Deliver finished product to market

1997 Ford 3500 Gallon Pump Truck

Use:

- Pump liquids from mixing pit and spray onto windrows
- Land apply lime stabilized water from dewatered grease trap waste

*Pump truck **not** to be used for watering road to control dust.*

Knight Mixer

Use:

- Mix recipes for compost mix
- Top dress windrows after turning to create filter effect

McCloskey Screener

These activities are detailed in the operation and maintenance plan.

11. Vector Reduction

On day of arrival, putrescible materials will be mixed with wood chips to reduce nuisance vectors. Other component materials such as sawdust or bulking agents such as ground corn cobs or yard waste may be stored for longer periods. The VAR requirements established in rule shall be met through compost temperatures greater than 104 degrees F with an average greater than 113 deg F for at least 14 days.

12. Traffic Flow

Based on the maximum throughput production of the compost operation a maximum of two tractor trailer loads of compost per day would leave the facility on average. The over the road tractor trailers are anticipated to trailer on the gravel access road leading from the facility to Colt Thornburg Road, thence to NC Highways and roads for ultimate distribution in the area. Given the existing truck traffic from the facility, the additional effect on local traffic of a maximum of two trucks per day on average will be negligible.

H. Marketing Plan and Materials

A portion of the finished compost has normally been sold by bulk to local buyers. At present, Earth Farms Compost Facility has formed a marketing corporation to develop markets for soil amendment and bioretention area soil mixes.

Copies of the previous communication from the NC Division of Solid Waste regarding the Compost Facility are included as Attachment 6

I. SUBMITTAL

I.

Diamond Engineering and Consulting, PA appreciates the opportunity to compile this permit application for the Earth Farms Compost Facility. Initial development and final review of these materials was provided by Johnny H. Denton, P.E., P.L.S., Kimberly Fortner and A. R. Rubin. If either you or the NC DENR has any questions regarding this report, please contact us directly.

Sincerely,

Johnny H. Denton, P.E., P.L.S.
Diamond Engineering, PLLC

Kimberly Fortner
Diamond Engineering

A.R. Rubin

attachments

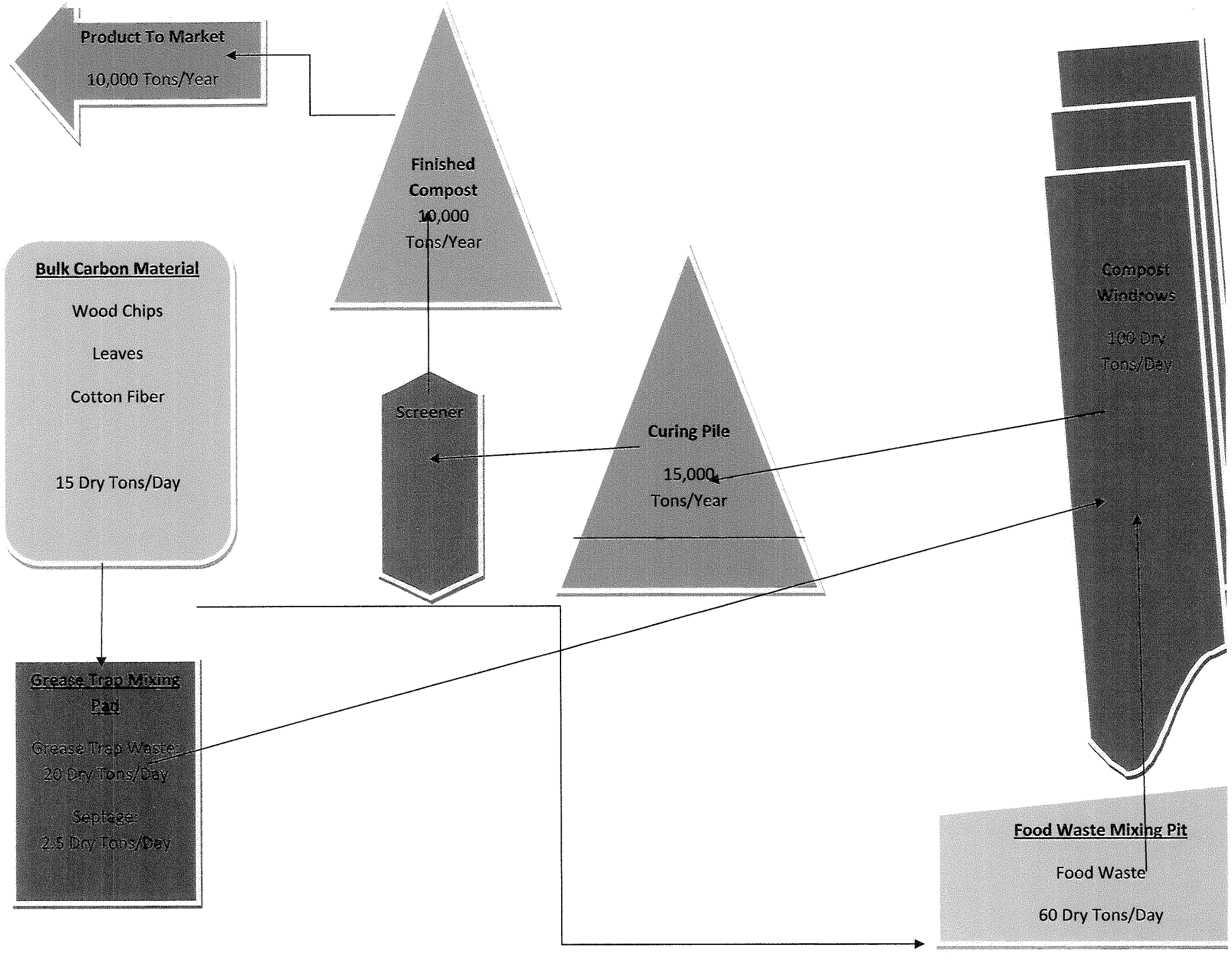
List of Attachments

ATTACHMENT 1

Site & Topographic Maps of the Compost Facility

ATTACHMENT 2

Design Schematics


Product To Market
10,000 Tons/Year
Finished Compost
10,000 Tons/Year
Bulk Carbon Material
Wood Chips
Leaves
Cotton Fiber
15 Dry Tons/Day
Screener
Curing Pile
15,000 Tons/Year
Compost Windrows
100 Dry Tons/Day
Grease Trap Mixing Pad
Grease Trap Waste:
20 Dry Tons/Day
Septage:
2.5 Dry Tons/Day
Food Waste Mixing Pit
Food Waste
60 Dry Tons/Day

ATTACHMENT 3

Compost Analysis Report

NCDA&CS Agronomic Division Phone: (919)733-2655 Web site: www.ncagr.gov/agronomi/ **Report: W03907**

Waste Analysis Report

Grower: **Earth Farms**
PO Box 184*
Stanley, NC 28164

Copies to: Barfield, Zachary

Farm:

Gaston County

Received: 11/24/2009 **Completed:** 11/30/2009

Sample Information	Laboratory Results (parts per million unless otherwise noted)														
Sample ID:	*N*		*P*	*K*	*Ca*	*Mg*	*S*	*Fe*	*Mn*	*Zn*	*Cu*	*B*	*Mo*	*Cl*	*C*
C1109	*Total*	13545	2028	4340	10469	1392	1534	6260	517	190	109	35.8			201772
Waste Code:	*IN-N*														
FCW	*-NH4*														
Description:	*-NO3*		*Na*	*Ni*	*Cd*	*Pb*	*Al*	*Se*	*Li*	*pH*	*SS*	*C:N*	*DM%*	*CCE%*	ALE(tons)
Composted Waste - Other	*OR-N*		458							7.57	160	14.90	73.24		
	Urea														

Recommendations:	**Nutrients Available for First Crop** *lbs/ton (wet basis)*													**Other Elements** *lbs/ton (wet basis)*						
Application Method	*N*	*P2O5*	*K2O*	*Ca*	*Mg*	*S*	*Fe*	*Mn*	*Zn*	*Cu*	*B*	*Mo*	*Cl*	*Na*	*Ni*	*Cd*	*Pb*	*Al*	*Se*	*Li*
Broadcast	7.9	4.1	6.1	9.2	1.2	1.4	5.5	0.45	0.17	0.10	0.03			0.67						
Soil Incorp	9.9	5.1	6.9	11.5	1.5	1.7	6.9	0.57	0.21	0.12	0.04			0.67						

North Carolina
Tobacco Trust Fund Commission

Reprogramming of the laboratory-information-management system that makes this report possible is being funded through a grant from the North Carolina Tobacco Trust Fund Commission.

Thank you for using agronomic services to manage nutrients and safeguard environmental quality.
- Steve Troxler, Commissioner of Agriculture

ATTACHMENT 4

Composting Operations Manual

OPERATION MANUAL WAS SUBMITTED EARLIER BY McKIM & CREED

ATTACHMENT 5

Gaston County Zoning Letter

GASTON COUNTY
Department of Planning and Development Services

Land Use Section
Mailing Address: P. O. Box 1578, Gastonia, NC 28053-1578 Phone: (704) 866-3075
Street Address: 128 West Main Avenue, Gastonia, NC 28052 Fax: (704) 866-3966

August 8, 2009

Tri County Environmental LLC.
Attn: Jim Lanier
131 Mariposa Road
Stanley, N.C. 28164

Re: Conditional Use Permit # CU07-04 for the proposed Wood Waste Grinding Operation located at 351 Colt Thornburg Road, Dallas, NC

Dear Mr. Lanier:

I am sending you this letter to address the concern of Mr. Michael Scott with NCDENR of whether the above reference Wood Waste Grinding Operation includes composting. The Conditional Use Permit for a Wood Waste Grinding Operation that you received approval for on October 24, 2007 does include composting as requested on your CUP application dated September 28, 2007.

If you have any other questions on this or other matters, please contact this office at 704-866-3072, between 8:30am and 5:00pm.

Thank you for your inquiry on this matter.

Sincerely,

Ronald L. Smith
Code Enforcement Administrator

cc: NCDENR
file

ATTACHMENT 6

Division of Solid Waste Communications

Tri-County Environmental Services

Technical Review Comments
For Solid Waste Composting Facility Permit Application
And
For Solid Waste Composting Facility Operation and Maintenance Manual

November 24, 2008

NOTE: Please provide a response to all of the comments on a "comment for comment" basis. Where appropriate, add or revise narrative in the text of both the Permit Application and the Operation & Maintenance Manual that addresses the issues discussed in the comments.

I. General

1. Both the Permit Application and the Operation & Maintenance Manual are considered engineering documents; therefore, the front page or cover of the documents should be signed, dated and sealed by an engineer licensed to practice in North Carolina. Please note that 15A NCAC 13B .1405(c)(2) requires a detailed operation and maintenance manual in addition to the permit application.

II. Section 2.0 Application Requirements

1. 15A NCAC 13B .1405 (b) (1) stipulates that an aerial photograph or scaled drawing is needed, where one inch is less than or equal to 400 feet, accurately showing the area within one-fourth of the mile of the proposed site's boundaries with the following specifically identified:

(A) Entire property owned or leased by the person proposing the site;

(B) Location of all homes, wells, industrial buildings, public or private utilities and roads, watercourses, dry runs, and other applicable information regarding the general topography within one-fourth mile;

An aerial photograph or detailed drawing needs to be submitted to fulfill the requirements as listed above.

2. 15A NCAC 13B .1405(b)(2) A letter from the unit of government having zoning jurisdiction over the site which states that the proposed use is allowed within the existing zoning, if any, and that any necessary zoning approval or permit has been obtained.

The current zoning approval lists grinding as the approved process onsite. The letter should be updated to include composting or clarification provided by the zoning administrator.

3. 15A NCAC 13B .1405(b)(3) An explanation of how the site complies with siting and design standards in Rule .1404 of this Section.

A detailed narrative should address each requirement within Rule .1404 and that each requirement has been met.

4. 15A NCAC 13B.1405(b)(4)(A) A detailed report indicating the following:

(A) Waste type(s), source and quantity of the solid waste to be composted, including the source and expected quantity of any bulking agent or amendment (if applicable), any expected recycle of bulking agent or compost, and any seasonal variations in the solid waste type or quantity;

Estimated quantities of each feedstock and bulking material to be composted should be listed while also including any seasonal variations. Please note that section 1.0 of the operation guidelines lists non-solid waste sludges as feedstocks (DAF skimmings, sludge from meat processing, biological solids). These feedstocks would require the facility to operate on an impervious pad as a type IV facility. The feedstocks list needs to be revised to reflect wastes that can be accepted at a type III facility.

5. 15A NCAC 13B.1405(b)(5) Site plans at a scale where one inch is less than or equal to 100 feet to the inch that delineates the following:

(A) Existing and proposed contours, at intervals appropriate to the topography;

(E) Access roads, details on traffic patterns;

(I) Flood plains and wetlands.

These items need to be added to the existing site plan.

6. 15A NCAC 13B .1405(6) A description of the operation of the facility, which must include at a minimum:

(A) Name, address and phone number for the person responsible for the operation of the facility;

(B) Operation plan for the facility;

Within section 1.0 of the operation plan, there needs to be clarification on how runoff from the compost area, the mixing and blending area, the curing and storage area will all drain to the small collection basin. This runoff shall not enter the existing septage storage

tanks nor be land applied. The current tanks on site and the land application area are only permitted for septage. The runoff from the compost facility and the raw feedstocks other than septage cannot be stored in the tanks that are currently on site. These changes need to be reflected in the operating guidelines.

Section 1.1 of the operating guidelines should reflect that the required temperature for windrow composting is at or above 131 degrees F for 15 days. This section should also clarify along with the site plan the 6 bay areas that are described.

Section 1.1 should also describe how liquid materials are going to be contained on the concrete pad during the mixing process. This section also states that liquid will be transported to mixing tanks 7 or 8. These tanks are currently permitted only for septage. Clarification needs to be provided on this point. Additional tanks may be needed for non septage liquid waste.

Section 1.1 should also clarify when temperatures are taken within the windrows (the current submittal notes daily - seven days a week).

The QA/QC protocol within section 1.1 should state that compost sampling will occur every 20,000 tons or six months. This section should also include language on the inspection of incoming materials.

Section 1.2 describes an equalization basin. This basin is not listed on the existing site plan.

Section 1.3 incorrectly lists the temperature requirements for an in vessel system rather than a windrow system.

Section 1.4 mentions that the remaining PFRP temperature is achieved in Bay 4. The PFRP requirements are met in the windrow. This section should be updated and clarification provided on the bay descriptions.

Section 1.6 refers to a 32,000 pound batch of compost. Is this a batch for a windrow or an in vessel compost system?

Section 2.2 lists the compost testing requirements at every 3 months or 10,000 tons. Please note .1408 requires compost to be tested every 20,000 tons or six months.

Section 2.4 lists the possibility of land applying collected leachate onto lands permitted by NC DWQ. The current site only has land permitted for septage applications. In result, collected leachate could not be land applied to the permitted areas adjacent to the compost facility.

Section 2.7 item five also lists the possibility of land applying collected leachate. This practice cannot occur on the current land application site.

Section 2.7 item seven lists the possibility of land applying compost that is a Class B material. It needs to be stated that land application of a class B material requires approval from the Division of Waste Management.

Section 4 lists a land application alternative as a procedure to handle a long term market decline. This procedure should include that the material must be a Class A product to be land applied or an approval from the Division of Waste Management must be obtained.

Section 5.2 (Routine Compost Sampling Procedure) states that compost must be sampled once every 10,000 tons or every three months. This interval is acceptable but note that the .1408 rules only require sampling every 20,000 tons or six months.

(G) A description of actions to be taken to minimize noise, vectors, air borne particulates.

The above items need to be added to the existing operation plan for the facility.

7. 15A NCAC 13B.1405(7) A report on the design of the facility, including:

(A) Design capacity of the facility

(B) A process flow diagram of the entire facility, including the type, size, and location of all major equipment, and feed stock flow streams. The flow streams shall indicate the quantity of material on a wet weight and volumetric basis;

(C) A description and sizing of the storage facilities for amendment, bulking agent, solid waste, recyclables, and finished compost;

(D) The means for measuring, shredding, mixing, and proportioning input materials;

(E) Anticipated process duration, including receiving, preparation, composting, curing, and distribution;

(F) The separation, processing, storage, and ultimate disposal of non-compostable materials, if applicable;

(I) The method of aeration, including turning frequency or mechanical aeration equipment and aeration capacity;

(J) A description of the air emission and control technologies;

(K) A description of the method to control surface water run-off; and the method to control, collect, treat, and dispose of leachate generated; and

(L) A description of any recycling or other material handling processes used at the facility.

8. 15A NCAC 13B.1405(b)(8) A description of the label or other information source that meets the requirements of Rule .1407(g) of this Section.

9. 15A NCAC 13B.1405(b)(9) Engineering plans and specifications for the facility, including manufacturer's performance data for all equipment selected.

10. 15A NCAC 13B.1405(c) The following information is required for reviewing an application for a permit to operate a Type 4 or Large Type 2 or 3 solid waste composting facility:

(1) Contingency plans detailing corrective or remedial action to be taken in the event of equipment breakdown; air pollution; non-conforming waste delivered to the facility; spills, and undesirable conditions such as fires, particulates, noise, vectors, odors, and unusual traffic conditions;

(2) A detailed operation and maintenance manual. The manual must contain general design information, a discussion of compliance with operational requirements as outlined in Rule .1406 of this Section, detailed operational information and instruction, equipment maintenance, list of personnel, required personnel training, outline of reports to be submitted in compliance with this Section, and safety instructions;

(4) A fact sheet and process flow diagram that summarizes actual equipment sizing, aeration capacity, detention times, storage capacity, and flow rates (wet weight and volumetric) for the system and equipment chosen;

(5) As-built drawings;

(7) Product marketing and distribution plan.

End of comments

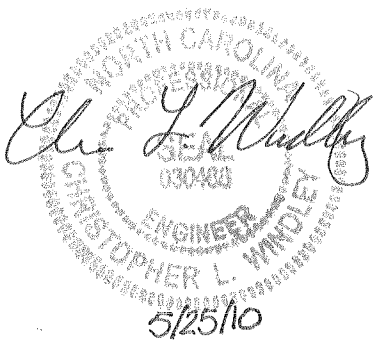
Earth Farms, LLC
Compost Facility
Operations Guide
Large Type III Facility

July 10, 2009
Revised May 25, 2010

APPROVED
MES
8/12/10

Prepared for: Earth Farms, LLC
315 Colt Road
Dallas, NC 28344

Developed by: Jim Lanier, Stanley Environmental
Dr. A. R. Rubin, McKim & Creed, PA
Chris Windley, P.E.



McKim & Creed, PA
1730 Varsity Drive, Suite 500
Venture IV Building
Raleigh, NC 27606
(919) 233-8091 (O)
(919) 233-8031 (F)
License #: C0342

Earth Farms LLC Large Type III Compost Facility Information

Owner: Jim Lanier

Location: 315 Colt Rd
Dallas, NC, 28344

Permit: C 0342

Primary Contact: Jim Lanier

Office: 704 263 8186
Cell: 704 860 5534

Regulatory Agency Emergency Contact:

NCDWM, Mooresville Region: Charles Gertsell (704 663 1699 or 704 235 2144)

Hours of Operation:

Monday to Friday: 6:30 AM – 7:00 PM
Saturday: 7:00 am – 3:00PM
Sunday: Closed

Prohibited Feedstock:

Domestic and municipal wastewater plant sludge
Hazardous waste
Infectious waste

Earth Farms, LLC Compost Facility - Operations Guide

1.0 Introduction

The Earth Farms, LLC Compost Facility is located in Gaston County, North Carolina, near the intersection of Colt Road and Bob Friday Rd., approximately 3 miles northwest of Dallas, NC. This facility currently operates in accordance with a demonstration permit, and will be permitted by NCDENR-DWM as a Large Type 3 composting operation. The purpose of this operations guide is to comply with Section 1406 of the DWM regulations. Key personnel involved in the production of compost at this facility will read this manual to assure a basic understanding of the policies and procedures contained herein.

The raw feedstock materials for the composting operation will come from permitted sources. Feedstocks will be approved for receipt by NCDENR-DWM or Compost Consultants based on testing. Currently, approved feedstocks include:

Permitted Materials:

- Septage
- Grease trap wastes and material from permitted waste sources such as scrapped manure or litter from local animal operations
- Sawdust from a local furniture manufacturer upon receipt of facility specific waste analysis data
- Ground yard waste
- Agribusiness residues or vegetative agricultural wastes and by-products (such as waste cotton fiber or gin trash, corn Stover, straw or wet hay)
- Land clearing debris
- Shavings and animal waste from any local livestock trailer wash or DAF skimmings
- Pre and post consumer food wastes from source controlled operations
- Untreated, unpainted new construction wallboard or gypsum-board,
- Wood pallets

Prohibited Materials:

- Municipal sludge

Materials composted must be addressed in the DWM permit. New feedstocks will be tested and approved by consultants or DWM prior to receipt.

The composting operation will be conducted in open windrows specifically designed for compost production. Feedstock storage and final composting/curing will occur on compacted pads. The windrows are fed from a concrete mixing pad and compost is discharged following the windrow process to a second portion of the compacted pad. The mixing pad has a wall or slope on the concrete pad to contain any runoff. All liquid generated will flow to the liquid collection tank. Flow is along a slope or gravity gradient to the collection tank. The compacted and concrete pads will also help prevent introduction of undesirable material such as stones into the compost. A

liquid collection tank will be used to handle any runoff/seepage liquid from the mixing area. The collected liquid can be used to replace moisture in the composting windrows, or will be transferred to the storage basins for land application.

1.1 Composting Requirements and General Operations

Compost is defined by the U.S. Composting Council as "the product resulting from the controlled biological decomposition of organic matter that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth." Composting is accomplished by mixing an energy source (carbonaceous material) with a nutrient source (nitrogenous material, phosphorus containing materials) in a prescribed manner to meet microbial requirements necessary to support metabolic processes. Moisture levels, solids levels, and nutrient levels in the compost feedstocks are controlled to assure the process reaches the required temperatures for the time prescribed by rule (15 days after above 131 degrees F with 5 turnings in that 15 day time). The process is carried out under specific moisture and temperature conditions for a specified period of time. Certain steps and procedures are necessary to ensure that the composting process proceeds properly with a minimum of odors, adverse environmental impacts, and other process related problems.

The facility will be divided into five (5) distinct areas. These are receiving Bay 1, where raw materials are received, this does include the mix pit at the entrance to the process here incoming materials are mixed and blended in preparation for subsequent mixing with dry materials and placement in the windrows; Bay 2, where the materials are mixed and blended for subsequent compost operations; Bay 3, where Carbon Source materials and bulking material are stored. ; Bay 4 where materials are windrowed and further processed to meet Vector Attraction Reduction (VAR) requirements and Process to Further Reduce Pathogen (PFRP) levels associated with active composting, and; Bay 5, where materials are cured and stored prior to transport off site (this is a compacted, earthen lined exterior storage area where finish compost is field stored and awaiting transport to various markets).

Materials permitted for receipt at the facility will be received at Bay 1. Solid and Semi Dry materials from off-site sources (litter, shavings, etc) will be stored on the compacted pad awaiting blending. Liquid materials (liquid sludges or other wastes from permitted operations) will be transported to the site in a leak proof water-tight vehicle and transferred directly to the Mixing Tanks 7 & 8. This will be accomplished in batches of 6000 gallons or less. Liquid will be removed from transfer trucks using a vacuum pump. Liquid will be transported from the service vehicles to the Mixing Tank immediately upon receipt at the facility. Grease Trap and Septic Waste that is processed through the Dewatering box will be dumped onto the mixing pad for proper mixing with the Carbon Source at Bay 2. A volume of wood shavings or litter equal to the volume of liquid material will be placed on the pad, liquid from the mixing tank or one of the storage tanks will be pumped onto the dry material, and the material will be mixed for approximately 30 to 60 minutes to assure complete mixing. This process is not intended to generate excess liquid. Should liquid be generated during mixing, it will be collected and discharged to the liquid collection tank described above. Prior to blending or transport into the compost windrows (Bay 4), all materials will be examined to assure proper moisture level (upon firm squeezing, material will release a thin film of water to a hand of a few drops). If material is

too wet, additional bulking material will be added; if too dry, additional wet material will be added. Dry materials will be mixed or blended at the proprietary mix or blend ratios developed at Earth Farms LLC for various compost uses. These dry materials will be mixed on the concrete pad at Bay 2 using a front end loader bucket for initial mixing, and then run through a Knight Mixer for additional mixing if needed.

Materials will be added to the windrows through the Cat Loader mixer buckets and by dump truck. Feedstock materials will be transported to the windrows and placed carefully in windrows by lifting and dropping materials to provide final mixing and blending, preliminary aeration, and minimal compaction prior to windrow activities. Material placed in this manner should heat adequately to assure PFRP compliance. Temperatures will be monitored and recorded daily to demonstrate compliance with PFRP requirements. Windrow areas are designated on the facility permit and all windrows will be marked with date of formation and dates of turning. Typical windrow dimension will be 16 feet (W) x 6 feet (H) with length ranging between 150 to 300 feet.

Material will be discharged from the windrows after achieving the VAR and PFRP compliance. Demonstrated compliance with VAR is temperatures exceeding 104 degrees F for 14 days or longer, and averaging 114 degrees F or higher for the 14 day period. Compliance with PFRP involves maintaining temperatures at or above 131 degrees F for 15 days with at least 5 turnings of the windrows. These PFRP temperatures have consistently been exceeded in the VAR area of windrow operations and a PFRP windrow is a "de facto" VAR. Material will be moved clockwise through Bay 3 using a front-end-loader bucket and windrow turner until material has achieved required VAR and PFRP compliance and has been rotated in the windrow for 90 to 120 days. Temperatures will be monitored at specified locations along an active windrow. These are 20%, 40%, 60% and 80% of the length and at a depth of 24" into the windrow. Temperature monitoring will be accomplished Monday through Saturday.

Pile venting and additional turning will be necessary if the compost temperatures remain in excess of 140 degrees immediately prior to bagging, bulk mixing, or bulk transport. In lieu of bagging or bulk loading, compost that has completed the VAR and PFRP process in Bay 4 may be transported outside the windrow area to Bay 5, the bulk storage area for additional curing or stock-piling to insure sufficient material is available for large orders. The exterior storage area consists of compacted earthen pads.

A quality assurance/quality control program will be instituted at Earth Farms, LLC. This process will help to assure:

A. compliance with appropriate rules and regulations
B. product quality consistent with specified or designated end use
C. trained personnel remain available to manufacture quality compost

The QA/QC effort will involve the compliance testing and monitoring including: routine temperature monitoring and recording, nutrient and regulated metals testing, foreign material content and bacteriologic sampling. The compliance testing for regulated metals and bacteria will be conducted by a private certified laboratory. Sampling will be conducted every 20,000 tons of material produced or twice (6 month intervals) per year. Annual calibration will be

required on temperature probes. An annual report submitted to DWM is required as a part of the QA/QC program.

In the event that an additional raw material stream becomes available to be added to the composting operation, the material will be submitted for review and approval by the DWM-Solid Waste Section or to this consultant prior to use as a feedstock. The following procedure will be utilized to submit raw materials for approval to the Solid Waste Section. A sample of the raw material will be taken according to the protocol detailed in Section 5.2 of this manual. The sample will be analyzed for the parameters listed in Table 2, Section 5.3 of this manual. A report of the analysis results and a written request for inclusion of the raw material, including proposed handling instructions for the raw material, will be submitted to the Solid Waste Section. Upon notification of approval of the raw material by the Solid Waste Section, the raw material may be incorporated into the process used for compost production. Incoming or raw material will be inspected visually to assure unwanted trash is not present, that no material received is prohibited by permit, and that the material received is authorized under the permit.

1.2 Moisture

Appropriate moisture is necessary to compliment the biological processes of the microorganisms responsible for the degradation of organic matter and stabilization of compost. Composting is a naturally occurring aerobic process. Consequently, the moisture content is influenced by the necessity of supplying oxygen and venting off-gasses. As moisture increases, the particles in the compost become more dense and air spaces shrink, limiting the supply of oxygen and the ability to off-gas. If oxygen supply drops to below 8%, the process becomes anaerobic and slows dramatically. The results are foul odors, and the need to restore the aerobic conditions, which will delay the processing time and reduce production rates.

Experience has shown that oxygen consumption in compost increases at moisture contents above 40% and reaches a maximum at 60%. Based on the proposed ratio of materials, the initial moisture content will be reduced from approximately 70% to the optimum initial moisture level of 60 % by mixing the wetter feedstocks with dry materials such as wood-chip, poultry litter, sawdust shavings or gin trash, and cotton waste. The initial moisture levels encountered of near 70% will possibly slow the degradation process of the compost materials until moisture reduces to approximately 60%. As a consequence, the wetter feedstocks will be mixed with dry materials on a 50/50 volume ratio to increase solids levels and reduce moisture levels to a more optimum level prior to feeding the materials into the bin. The optimum moisture content for compost materials transported to the windrow is 60% to 65%. This is the target for this operation and it will be met by the 50/50 mix (by volume) using the front-end-loader to mix and blend feedstocks. All mixing and blending of feedstocks will occur on the concrete pad located at the end of the initial receiving bay.

The composting process may also be inhibited when moisture levels fall below 40%. Moisture levels will be maintained such that compost materials are thoroughly wetted without being waterlogged or dripping excess water. As a rule of thumb, the compost materials are too wet if water can be squeezed out of a handful and too dry if the handful does not feel moist to the touch or if firm squeezing does not result in a film of water on the hand or gloved hand. A moisture

meter, similar to that described in the Equipment Specifications (Appendix 2), would provide a more accurate determination of the initial moisture content of the compost material, but is not considered necessary for operation of the facility.

If the compost needs additional moisture, leachate contained in the collection basin can be used to add moisture during the composting process or if the material is just entering the process; water will be required if the material has proceeded through the PFRP process. The addition of leachate requires the Process to Further Reduce Pathogens (PFRP) to begin as the leachate is added. The basic compost materials, with the exception of the sawdust, litter, cotton wastes or gin trash and corncobs, are quite wet and therefore it is unlikely that very much additional moisture will be needed. In all likelihood, the material will normally compost "as-is" or may require moisture removal as achieved through blending with dry feedstock materials.

Given that multiple windrows are presently used, excess moisture can be managed by simply allowing the initial heating cycle to rise, or by turning the windrows frequently to drive water vapor off by venting excess moisture to the atmosphere. The higher heat process will also have the additional beneficial effect of killing off potentially pathogenic organisms such as coliform or salmonella, helminthes eggs or cysts, or inactivating viruses and other organisms regulated in waste treatment processes.

Particle size and structure are also important when determining the optimum moisture content. Generally, the smaller the particles, the more available surface area for microorganism habitat and greater microbial activity. This is only the case if sufficient oxygen is available. Insufficient oxygen presents the same problem described earlier with too much moisture. A combination of excessive moisture and small particles is doubly detrimental. A typical guide for particles 15 mm (1/2 inch) in diameter or larger is to keep the compost mixture content at 55-65% moisture. If the particles are 5-15 mm (less than ½ inch), a 45-55% moisture content is recommended. If particles are too small and/or wet, bulking materials such as sawdust or ground corn cobs or ground wall-board can be added. This is also subject to variation depending on the specific materials available for the compost.

1.3 Temperature

Temperature should be monitored closely at 20%, 40%, 60% and 80% of windrow length in all active windrows and recorded daily. Metabolic or biological activity increases with increasing temperature. The optimum temperature range for composting is between 130° F (54.4° C) and 160° F (71.1° C) once the process has begun. As stated in the North Carolina Solid Waste Compost Rules section .1406, the facility shall maintain the compost process at a temperature above 131° F (55° C) for 15 consecutive days or longer, with 5 turnings, and the average temperature during that time shall be higher than 131° F (55° C) to ensure the highest level of pathogen reduction. If pile temperature falls significantly during the composting period, odors may develop. If the pile material does not reach operating temperature, investigate piles for moisture content, porosity, and thoroughness of mixing. Compost managed at the required temperatures will favor destruction of pathogens.

Monitor temperature of the compost windrows **daily – except Sunday.** Appendix 1 provides a Temperature Record form. The system operator should monitor temperatures at specified monitoring locations along the windrow. Temperature monitoring locations are 20%, 40%, 60% and 80% of the total length of the windrow. The temperature monitoring probes consist of 36 inch to 48 inch long dial stem thermometers. Temperature monitoring shall be accomplished at the 24 to 30 inch depth at each monitoring location. At least annually, the temperature probes must be calibrated to assure they are reading temperatures accurately.

1.4 Mixing and Process Time

Mixing the compost with the Bachaus windrow turner is necessary to ensure that all particles are exposed to the high temperatures required to inactive potentially pathogenic microorganisms. The mixing redistributes air pockets to insure proper oxygen levels for the composting process. The mixing is accomplished by the rotation of the composting mass. Mixing in the windrow with the turner assures that all particles in the compost mass are exposed to the required temperatures for the required time. Pathogen reduction (PFRP) is achieved in the active compost windrow.

Mixing of raw materials with the loader should be done to evenly distribute additives and bulk materials throughout the composting material. Feedstock mixing and blending shall be done on the concrete pad. Feedstock mixing and blending prior to composting shall be done by mixing approximately 50% active materials such as the dewatered septage and grease trap wastes with approximately 50% wood chip/sawdust, 50% yard and leaf waste, etc. The pre-compost mixing shall be accomplished by successive scooping, lifting and falling of materials with a 3 cubic yard front-end-loader bucket. At least three scoop/lift/fall cycles will be required to mix materials adequately. Liquids will be placed in the mass of material by creating a "v" shaped trough in the dry materials prior to adding the liquid materials.

The remaining PFRP compliance temperature is achieved in Bay 3 and may require 30 days to achieve required temperature and maintain required temperatures, and a curing stage follows the active compost phase. The curing phase may require as much as 90 days of storage in Bay 4. Materials may be bagged or moved to bulk outside storage following finishing in Bay 4. Disposition of compost following compliance depends on market outlets. The finished product is normally dark brown to black in color with a 60%-65% solids composition based on analysis. The odor is slightly earthy or musty and texture is loose. The finish product volume is roughly 30 % to 50 % (one third to one half) of the original volume.

Composting time required is primarily a function of the amount of air supplied. The efficiency can be increased and composting time decreased with added aeration by forced air or increasing turning cycles. This also produces a cooling effect which must be monitored. Once the composting process is complete (as measured by PFRP Compliance), the compost can be stockpiled without monitoring until used.

1.5 Carbon : Nitrogen Ratio (C:N)

The carbon to nitrogen ratio is the most important chemical consideration in compost. The C:N ration desired is between 25:1 and 40:1. Other nutrients are generally contained in sufficient ratios for composting in most organic wastes. Carbon and nitrogen are consumed in the decomposition process at a rate which is proportional to one another.

The main goal is to produce a compost which will not deprive soil of its natural nitrogen due to a nitrogen deficiency in the compost. A low carbon to nitrogen ratio during decomposition will result in ammonia volatilization. A high carbon to nitrogen ratio reduces the efficiency of the process, because more microbial activity is required to reduce the C:N ratio. The optimum C:N ratio for finished compost is between 25:1 and 40:1 (carbon to nitrogen).

1.6 Compost Recipes

Ongoing analysis has produced several compost recipes with potential for use at the composting facility. These recipes assume a "Plug Flow" batch of compost. The process time for the compost batch is normally 120 – 160 days in the Windrow and another 120 days in the Curing Pile prior to being screened and ready for market.

Typical chemical and moisture characteristics of common raw materials used in composting operations are shown in the following table.

Table 1. Raw Material Characteristics

Raw Material[1]	% N	C:N Ratio	% Moisture Content
Vegetable Waste	4.2	10:1	82
Dewatered Septage	3	25:1	70
Dewatered FOG	1.5	50-60:1	70
Hardwood Sawdust	0.09	560:1	25
Sawdust Bedding	0.24	442:1	40
Ground Corn Cobs	.6	98:1	15
Gin trash/cotton waste	.5	120:1	10
Ground Yard Waste	.9	80:1	40
Land Clearing Debris	.09	560:1	--

[1]Nitrogen and Carbon Information based on data from "On-Farm Composting Handbook" or testing on-site materials

2.0 Operations

The Earth Farms, LLC Compost Facility will be operated daily, from 7:00 am until 6:00 pm Monday through Saturday. Additional hours of operation may occur during periods of high

demand for the finished compost material; however, no Sunday operations are planned. Operations will proceed according to the requirements and procedures detailed in this operations manual.

2.1 Personnel Duties and Requirements

1. Compost Facility Operator - This individual is responsible for overall operation of the Compost facility. He is responsible for loading the proper amount of the selected raw material into the mixer to insure a good quality finished compost. In addition, the facility operator is responsible for maintaining all the temperature monitoring logs and collecting samples of the finished compost for analysis.

2. Assistant Facility Operator(s) - This individual will assist the facility operator, as necessary, and additionally will be responsible for upkeep and clean up around the compost facility. This individual will perform routine preventative maintenance on the composting equipment. This position will be filled as required, and may require more than one person.

3. Maintenance crew - These personnel will be provided from the on-site pre-treatment plant or staff available to Tri-County Environmental from other operations as maintenance staff required to perform major maintenance or repairs on the composting equipment.

4. Equipment crew - These personnel will be responsible for screening and custom blending the finished compost material, and for loading trucks for delivery.

5. Transport - These personnel will operate over-the-road transfer trucks. The compost will either be trucked to the final destination by over-the-road trucks, or may be removed by vendor trucks as well, depending on size of the order. It is anticipated that direct sale of bulk material to local contractors would be accommodated by direct loading of the buyer vehicles (private trucks or trailers).

2.2 Compost Testing Needs

In addition to the routine testing of the compost material every 20,000 tons or every 6 months for the parameters specified in Section 5 of this manual, and the 6 day/wk monitoring of the composting process for temperature, it may be advantageous to test compost material for carbon, nitrogen, moisture, and pH should compost fail to reach desired temperature or if odor problems develop. The finished compost material will be monitored every 6 months or 20,000 tons of compost processed (the smaller of the two) for nutrients and regulated metals tested by the North Carolina Department of Agriculture. More frequent testing will be accomplished as additional feedstock is added or as process optimization begins, to ensure that the composting process has been successful and that the NC Solid Waste Section annual reporting requirements have been met.

2.3 Storage

Storage of finished compost should be limited to 4 months after completion of the process. Compost should be utilized within this time period if at all possible. Storage will be provided in either open areas of Bay 4, or open exterior storage in the area designated, immediately south of the processing area, and on land out of the flood-plain.

2.4 Maintenance Practices and Cleanliness

In order to optimize the composting process, proper maintenance of the facility and equipment is recommended. Listed below are some maintenance practices that can be implemented to ensure the productivity of the facility.

1. Do not allow any equipment that exceeds design load limits on or within twenty feet of the concrete pad.

2. Maintain all electrical and mechanical equipment in good operating condition by following electrical codes and manufacturers' recommendations. Inspect and repair grounding rods, switches, wiring, and all vehicles and equipment involved in the process.

3. Fences, railing, roofing, and/or warning signs must be maintained to provide warning and prevent unauthorized entry.

4. Repair any vehicular, vandalism or animal damage. Inspect and maintain runoff control structures.

5. Keep the area around the composting facility mowed and free of tall weeds and brush.

6. Clean, shovel, or dry sweep compost production and bagging areas as required to maintain pleasant work environment. Clean and dry any oil spills, wet material spills immediately to sustain reasonably safe work environment.

7. A small liquid collection basin will be used to handle any leachate from the compost mixing area. Contents of the basin will be removed as needed and will normally be incorporated back into compost batch as a liquid and nitrogen source. The addition of leachate to any of the compost requires the Process to Further Reduce Pathogens (PFRP) to start at the time the leachate is added to the compost. In an emergency, the collected leachate will be transferred to the City Of Cramerton WWTP.

The following is a list of practices that will reduce the potential of odors being emitted from the Compost Site. Where practical, some or all of these practices may be utilized. The odor management practices include:

1. Avoid overly wet feedstocks and compost. The use of relatively coarse co-composting materials that allow oxygen diffusion into the pile can help avoid odor problems.

2. Activities such as mixing and movement of odorous raw materials should be scheduled to minimize the impact of odors. Accomplish these activities only early in the work day to take advantage of rising air currents. Avoid doing these activities on hot, still days or holidays and weekends. Windy conditions or early morning hours are better times to conduct such activities. Monitor the wind direction and postpone activities that may release significant odors when the wind is blowing toward the most sensitive neighbors.

3. Prevent puddles and standing water on the compost pad.

4. Minimize dust, which can transport odor.

5. Ensure that proper aeration, pH, and temperature control is maintained during the composting process.

6. Covering the upper third of the windrow with either 3 to 6 inches of finished compost, 3 to 6 inches of a stable, carbon rich material such as wood chip, or covering the area with a heavy (20 ml) plastic sheet or tarp.

2.5 Seasonal and Weather Management

Composting can continue year round, even during cold weather. Seasonal and weather variations may require operational adjustments that compensate for the change in weather conditions. The insulation layer covering the windrows should sufficiently buffer the mass of materials in the windrow against temperature variation, and changes in the operation should not be required.

Cold weather can slow the composting process by increasing the heat transfer rate from the composting operation into the atmosphere, but the insulation layer should mitigate this transfer. The lower air temperatures reduce the microbial activity, especially near the surface. This, in turn, decreases the amount of heat generated.

Warm weather enhances water loss due to evaporation from the windrows. Water or recovered leachate should be added if materials become too dry (moisture content drops below 40%). Again, the loss should not be excessive from the windrow, and controls can be implemented by scheduling turning operations or adding moisture as required.

In event excess liquid accumulates on the site because of wet weather or other adverse condition. That excess liquid will be collected in a tank truck and transported to an approved liquid handling facility such as City of Cramerton POTW.

2.6 Contingency Plans

1. Equipment Breakdown

In the event of a breakdown of the compost equipment (turner, loader, screens, etc.), delivery of raw materials from the on-site treatment facilities should be suspended until the equipment is repaired or replaced and material passes all VAR and PFRP requirements.

2. Fire

In the case of a fire, immediately notify the local fire department. If employee safety is not compromised, the company pump truck may be utilized to extinguish the fire.

3. Freezing Conditions

Operation in freezing conditions requires more frequent inspection of the leachate collection system to insure the drains do not freeze and allow leachate liquid to pool on the concrete pads or windrow areas. Additional caution in operation of the turner and loader is necessary during conditions where ice may have formed on the site. Frozen raw materials should not be added to the bulk mixer due to the possibility of damaging the mixer blades and auger.

4. Extended Power Failure

Operations during an extended power failure may be accomplished by the use of a portable generator. Temperature monitoring of the composting windrows during a power failure must be continued, and any compost which does not meet the temperature criteria must be re-processed.

5. Windy Conditions

Windy conditions should have little effect on the composting operation since windrows are in open areas. However, during windy conditions, special attention must be given to the temperature of the windrows, and care must be taken during the loading of raw materials (especially light materials such as sawdust) which could tend to "blow off" the composting area. It is anticipated that the local vegetation (tree line) will tend to block a great deal of the wind from the facility. However, if windy conditions are demonstrated to have a detrimental effect on the continued processing of the compost, consideration will be given to planting additional windbreaks.

6. Disposal or Re-Processing of Poor Quality Products

It is anticipated that the compost produced at this facility will easily meet the standards for Class A compost. In the event that a batch of compost does not meet the requirements for Class A compost, several options exist. An initial option would be to re-process the

batch in an attempt to meet the Class A compost requirements. This option would be selected if the controlling factor indicating poor quality was pathogen reduction.

Compost materials which do not meet Class A compost requirements but meet the Class B compost may be land applied under specific circumstances in accordance with a separate permit. Specifically, these materials could be applied to agricultural land, provided the land is used for silvicultural or non-food chain related production, or the material could be used for land reclamation projects. Compost which does not meet either Class A or Class B criteria, and is deemed undesirable for any attempt at re-processing, will be disposed of in an appropriate approved, sub-part D landfill site.

3.0 Equipment Specifications

The equipment required to operate the Earth Farms, LLC Composting Site can be characterized as either processing or monitoring equipment.

3.1 Processing Equipment

The primary processing equipment currently utilized at the site for composting is a Wildcat Compost Turner and a Bachaus Compost Turner. The Wildcat windrow turner is pulled by a Case 4 wheel drive tractor. The windrow turner is powered by a diesel engine which rotates the blades in a backward rotation, which turns the bottom center of the windrow outward. Both turners straddle the windrows, which are 16 ft wide and 6 ft high when in the beginning stages. Equipment may change with time, but basic functions associated with each will remain as critical to the process. Equipment may be replaced with like equipment.

A rubber tired Cat Loader and a dump truck will be used to transport the raw compost mix to the windrows. Finished compost shall be transported by loader or dump truck to the storage area (Bay 4) and segregated into batches in the storage area.

3.2 Monitoring Equipment

A probe-type dial stem thermometer (as manufactured by REOTEMP) with a 36" stainless steel stem will be needed to monitor the temperature of the compost in the finishing piles in Bay 2. The thermometer should have a temperature range of 0-200 degrees Fahrenheit.

An additional, optional device that can prove very useful in the production of compost is a moisture meter. This device is more accurate than the "hand squeeze" method of moisture determination. REOTEMP Instrument Corporation has developed a moisture meter which determines moisture levels via a sensor that measures electrical conductivity of the raw materials. The device is available in lengths of 36", 48", and 60".

Equipment specifications for the equipment discussed above can be found in Appendix 2.

4.0 Nutrient Management Plan

The majority of the compost produced by the Composting Facility will ideally be sold as a soil amendment. Additional or excess compost will be sold in bulk to local greenhouses and landscape contractors for use as a soil amendment or to the NCDOT for use in highway landscape projects.

In the event of a long term market decline, it may be desirable to land apply some compost off-site. In this case, the material must be a Class A product, or an approval from the NCDWM must be obtained. Land application to agricultural cropland may be used as long as appropriate records are maintained. Compost application rates will vary depending on the agronomic needs of the crop and whether the compost is being used as a primary nutrient source. If the finished compost is used as a primary nutrient source, it should be spread following agronomic practices used for spreading manure. However, compost is generally spread onto land at a thickness of 0.5 to 1 inch. If it is applied at a rate greater than this, it becomes too difficult to incorporate into the soil. Conventional manure spreaders are ideal for handling and spreading compost.

5.0 Compost Record Keeping, Analysis and Reporting Requirements

The compost produced at the Earth Farms, LLC Compost Facility will be routinely analyzed to insure quality control is maintained. Analysis shall be conducted by the North Carolina Department of Agriculture (NCDA), Soil Test Laboratory on Blue Ridge Road in Raleigh, or by a certified analytical laboratory (A and L, Prism Laboratories, Southern Testing, etc.). The compost will be monitored for temperature daily to insure vector and pathogen reduction compliance (see record keeping forms in Appendix 1). An annual report will be submitted to the NC Solid Waste Section by August 1st of each year, in compliance with NCAC 13B Section .1408 (c).

5.1 Daily Record Keeping

The compost facility will maintain daily (except Sunday) temperature, compost processing length and daily volume of compost processed records for the composting operation. In addition, the volumes of the various feedstocks will be recorded to ascertain the optimum mix and blend ratios for the continued operation at this facility.

5.2 Routine Compost Sampling Procedure

The compost must be sampled once per every 20,000 tons of compost produced or every six (6) months, whichever comes first. The samples will be obtained in a sterile manner according to the following procedure. The sample will be obtained from the finished compost piles, immediately prior to the screening and bagging equipment. The sample will consist of a multiple position composite grab sample. A minimum of 5 discrete locations within the finished compost pile in Bay 3, immediately prior to the screening /bagging and bulk loading processing of the pile, will be sampled as a composite sample. These sample locations should be taken from within the finished pile, and should represent a "cross section" of the pile, not just the "surface". The sampling will be conducted wearing latex or nitrile gloves, and the composite samples

should be well mixed to insure a representative sample is tested. Samples should be immediately refrigerated or placed in sealed containers in a cooler for transport to the laboratory. Collected composite samples should be placed in sterile bags provided by the laboratory if pathogen samples are to be run on the material. Samples should be delivered to the laboratory within 24 hours if pathogen testing is to be performed. It is essential to coordinate with the laboratory ahead of sampling to insure that the proper "hold times" for the various parameters to be tested are not exceeded. It may be desirable to run intermediate nutrient and heavy metal content samples at a more frequent interval than the once every 20,000 tons as specified by regulation.

5.3 Routine Compost Analysis

The analysis must include the parameters listed in Table 2 with measurements less than the regulatory limits based on dry weight (mg/kg) or percentage. Testing shall be conducted by private certified laboratories for regulated metals and bacteria. NCDA testing is adequate for nutrients, and foreign matter can be tested by trained personnel.

Foreign matter testing will be determined as follows. The compost material will be dried (EPA Method 160.3), weighed and passed through a one quarter inch (1/4") screen. All materials remaining on the screen will be visually inspected and all foreign material (glass, plastic, metal, etc.) will be removed and weighed. The weight of the removed foreign material, divided by the weight of the total dried sample, multiplied by 100% will be recorded and reported as the percentage foreign material observed in the sample.

Table 2. Routine Compost Analysis Requirements

Parameter	Reporting Unit	Test Method
Foreign Matter	%	As described in Subparagraph (2)(5) of 13B Section .1408
Cadmium	mg/kg dry weight basis	EPA Standard Methods 3050/3051
Copper	mg/kg dry weight basis	"
Lead	mg/kg dry weight basis	"
Nickel	mg/kg dry weight basis	"
Zinc	mg/kg dry weight basis	"
Pathogens (Fecal Coliform)	MPN/1000 grams of Sample	Standard Methods for the Examination of Water and Wastewater, Part 9221 E or Part 9222 D
Total Kjeldahl Nitrogen*	%	"
Phosphorus*	%	"
Potassium*	%	"
Salts*		NCDA Standard Analysis

* Not required by statute, but these analyses provide useful information on product quality

5.4 Annual Report

An annual report will be submitted to the NC Solid Waste Section by August 1st of each year, in compliance with NCAC 13B Section .1408 (c). The annual report will contain the facility name, address, permit number, a summary of the total quantities of raw material received at the facility, the total quantity of compost produced by the facility, and the total quantity of compost removed from the facility (marketed or disposed of off-site). The annual report will also include temperature monitoring records and the results of the required analysis for metals, pathogen reduction analysis (fecal coliform), and for the percentage of foreign matter in the finished compost.

6.0 Safety & Health

Proper attention to health and safety at composting facilities can prevent most occupational risks. The safety concerns in composting relate primarily to the use of equipment. If front-end loaders or other standard farm equipment is used, eye and ear protection should be used. Normal safety precautions, such as those provided with the equipment, should be followed. The Farm Safety

Association has developed a fact sheet (No. F-017 - Agricultural Machinery Hazards - See Appendix 3) which should be reviewed by all personnel operating or working near machinery.

Fires are rarely a problem in outdoor composting, as properly moist composting material does not readily burn. However, if material does dry out and if storage piles are too large, spontaneous combustion becomes a possibility. This phenomenon occurs at moisture contents approximately between 25% and 45%. In piles over 12 feet high, it is possible for the internal heat of the compost to initiate chemical reactions, which then lead to spontaneous combustion. Proper attention to moisture, temperature, and pile size is the best protection against this problem. An accessible water supply is a valuable safety precaution.

Human health concerns relating to compost depend both on the individual and on the material being composted. While few pathogenic organisms found in farm animal manures or vegetative wastes affect humans, normal sanitary measures are important (such as washing hands before touching food, eyes, etc.). Some individuals may be hyper-sensitive to some of the organisms in compost. The high population of many of the species of mold and fungi in an active compost process can cause allergic reactions in sensitive individuals. Simple precautions, such as wearing dust masks or even half-mask respirators with disposable cartridges, can help limit human exposure to organisms that may cause allergic reactions. Conditions which may predispose individuals to an infection or allergic response include allergies, asthma, such medication conditions such as antibiotics, punctured eardrum, weakened immune system, adrenal cortical hormones, etc. Workers with any of these conditions should not be assigned to a composting operation. If a worker does develop an allergic reaction to compost, it is important to recognize the problem promptly so that it does not develop into a chronic condition. To prevent health concerns during particularly dry and dusty conditions, a dust mask or half mask respirators should be worn.

Blood borne pathogen testing should be accomplished on employees of the compost operation as a part of the annual physical.

With proper knowledge, equipment, caution, and precautions, these sources of harm can be removed or limited, and injuries, illnesses, and deaths can be prevented.

Appendix 1. Record Keeping Forms

OFF-SITE COMPOST REMOVAL RECORD

Recipient's Name & Address	Date	Quantity Received	Signature

Earth Farms, LLC - Composting Site

Composting Activity Record

Batch Number	Date	Temperature Recorded (Yes/No)	Samples Taken and Submitted?	Moisture Added (gal)	Mixture Used - Volume of Feedstock, Sawdust, Manure and Bulking Material Used

Earth Farms, LLC - Composting Facility
Temperature Monitoring Record

Batch Identification Number: _____

Date Batch Started: _____

Data Collected By: _____

Sample Location (Drum or Windrow)	**Month/Year**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Sample Location (Drum or Windrow)	**Month/Year**	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

Appendix 2. Equipment Specifications

Appendix 3. Safety Information

FARM SAFETY ASSOCIATION
Growing Safety

AGRICULTURAL MACHINERY HAZARDS

FACTSHEET

The very fact that agricultural machinery uses tremendous power to do work makes its operation a potential hazard for both the operator and bystanders. Even though manufacturers try to ensure that their machinery is as safe as possible, the nature of some work creates inherent hazards, which cannot be removed. Most accidents with agricultural machinery can be attributed to human error.

In many cases the operator forgot something, took a shortcut or a risk, ignored a warning, wasn't paying close attention or failed to follow safety rules. Accidents with farm machinery can be crippling or even fatal. It is important to recognize and be alert to possible hazards and to take precautions to avoid injury.

There are many different kinds of agricultural machinery--mowers, tractors, shredders, harvesters, grinders, blowers, augers, balers, etc.--but they all have similar characteristics and similar hazards. You can be cut, crushed, pulled in or struck by an object thrown by these machines.

They can have cutting edges, gears, and chains, revolving shafts, rotating blades, levers and similar hazards. You can also be injured if you fall while working on or near any of these machines.

Some machine parts cannot be completely shielded in order to do their job. For instance, a cutting blade cannot be totally enclosed, or it could not cut. Operators remove guards for maintenance and often they don't get replaced. This creates a potentially dangerous situation.

Most agricultural machines have similar or common components to do their work. A basic understanding of these and the hazards they pose will heighten your safety awareness and prevent injury.

SHEAR POINTS

Shear points are created when the edges of two objects are moved closely enough together to cut a soft material, as in the case of a pair of shears or an auger.

Cutting points are created when a single object moves forcefully or rapidly enough to cut, as in the case of a sickle blade.

Both shear and cutting points are created on machinery designed to cut, as in harvesters, and on those that are not designed to cut, as in an auger. They are hazards because of their cutting force, and because they often move so rapidly that they may not be visible. It can be easy to forget that they are operating.

Because some cutting and shearing points cannot be guarded, it is important to be aware of the hazard and to be especially alert when they are operating. It is also important to warn others and to look out for their safety, because of the danger of thrown objects while using cutting-type equipment.

PINCH POINTS

Pinch points are formed when two rotating objects move together and at least one of them moves in a circle. For example, the point at which a belt runs onto a pulley is a pinch point.

Belt drives, chain drives and gear drives are other sources of pinch points in power transmission devices. Feed rolls, gathering chains and similar equipment to draw crops into the machine also create pinch points.

Fingers, hands and feet can be caught directly in pinch points, or they may be drawn into the pinch points by loose clothing that becomes entangled. Contact may be made by just brushing against unshielded parts or by falling against them.

You can become entangled in pinch points if you take chances and reach over or work near rotating parts. Machines move too fast to get out of a pinch point once you become caught in it.

To avoid injury from pinch points, be aware of the areas where pinch points occur and avoid them. Wear clothing that fits well and is not loose or floppy. Never reach over or work near rotating parts. Turn off machinery to work on it. Always replace shields if you must remove them for maintenance.

WRAP POINTS

Rotating shafts are the most common source of wrap point accidents, although any exposed machine part that rotates can be a wrap point. A cuff, sleeve, pant leg or just a thread can catch on a rotating part and result in serious injury. Entanglement with a wrap point can pull you into the machine, or clothing may become so tightly wrapped that you are crushed or suffocated. In other cases, you could be thrown off balance and fall into other machine parts.

Even a perfectly round shaft can be a hazard if there is enough pressure to hold clothing against the shaft. Shafts that are not round increase the hazard significantly. Clothing is more likely to catch if there is a little mud or dried manure, or a nick on the shaft. Ends of shafts that protrude beyond bearings are also dangerous. Universal joints, keys and fastening devices can also snag clothing.

Check all equipment for potential wrap points, and shield those that can be shielded. Place warnings on those that cannot be covered, or paint them a bright color, perhaps with wide stripes. Be aware of wrap points and be alert to their danger.

CRUSH POINTS

Crush points are created when two objects move toward each other or one object moves toward a stationary one. For example, hitching tractors to implements may create a potential crush point.

Failure to block up equipment safely can result in a fatal crushing injury. A jack may slip, a hose or overhead support may break, or the equipment may roll. Be sure to take extra precautions when working with machinery that is raised for any reason.

Crushing injuries most commonly occur to fingers that are crushed at the hitching point. Wait until the tractor has stopped before stepping into the hitching position.

If possible arrange the hitch point so that the tractor can be backed into position without anyone between. Always know what the other person is doing.

The head or chest of an operator may be crushed between the equipment and a low beam or other part of a building. Usually, these accidents occur when operating the machine in reverse Tree limbs are also potential hazards when working with tractors and other machinery.

To prevent being crushed or pinned, first, recognize the potentially dangerous situations, then, avoid them whenever possible.

Block all machinery securely if you must work under it. If an implement can roll freely, block its wheels so it cannot roll.

FREE-WHEELING PARTS

Many machine parts continue to spin after the power is shut off. Examples of this are cutter heads of forage harvesters, hammer mills of feed grinders, rotary mower blades, fans, flywheels, etc.

Never touch these parts until they have stopped moving completely. This may take as long as several minutes.

SPRINGS

Springs are commonly used to help lift equipment such as shock absorbers, and to keep belts tight and may harbour potentially dangerous stored energy. Springs under compression will expand with great force when released, and springs that are stretched will contract rapidly when released.

Know what direction a spring will move and how it might affect other machine parts when released, and stay out of its path.

HYDRAULIC SYSTEMS

Hydraulic systems store considerable energy. They lift implements, such as plows, change the position of implement components, such as a combine header or bulldozer blade, operate hydraulic motors and assist in steering and braking.

Careless servicing, adjustment or replacement of parts can result in serious injury. High-pressure blasts of hydraulic oil can injure eyes or other body parts by burning or penetrating the tissue due to the liquid being hot. Leaks are a serious hazard.

Never inspect hydraulic hoses with your hands because a fine jet of hydraulic fluid can pierce the skin. Jet streams from even pinhole leaks can penetrate flesh. Get medical attention quickly, or you could lose that part of the body that was injected.

Use a piece of cardboard to test the hose for leaks. Before attempting any service on hydraulic systems, shut off the engine, which powers the hydraulic pump.

Lower the implement to the ground and relieve the pressure. Follow the instructions in your operator's manual, because the specific procedures for servicing the systems are very important to your safety.

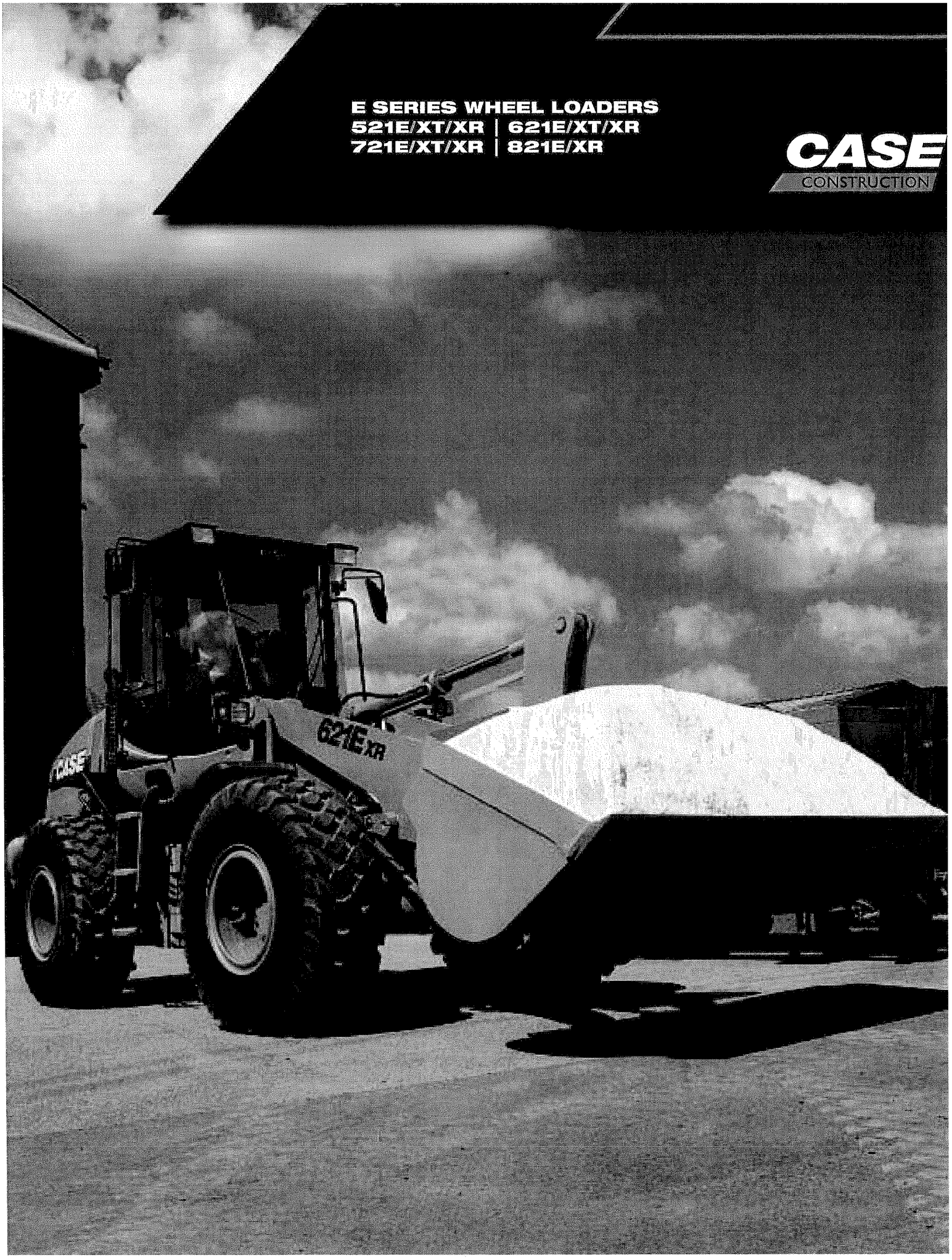
PULL-IN POINTS

Pull-in points usually occur when someone tries to remove plant material or other obstacles that have become stuck in feed rolls or other machinery parts. Always shut off the power before attempting to clear plugged equipment.

101-75 Farquhar Street, Guelph, Ontario N1H 3N4
(519) 823-5600

E SERIES WHEEL LOADERS
521E/XT/XR | 621E/XT/XR
721E/XT/XR | 821E/XR

CASE
CONSTRUCTION



E Series

CUSTOMER SUPPORT

Manage your equipment better with a Case Care℠ prepaid maintenance plan.

The Case dealer: Your professional partner

Your success starts with world-class Case machinery and attachments. Your Case dealer will help you work smarter and faster by selecting equipment that delivers performance and operator comfort. Your dealer has the knowledge and experience necessary to help you choose the right attachments so you can...

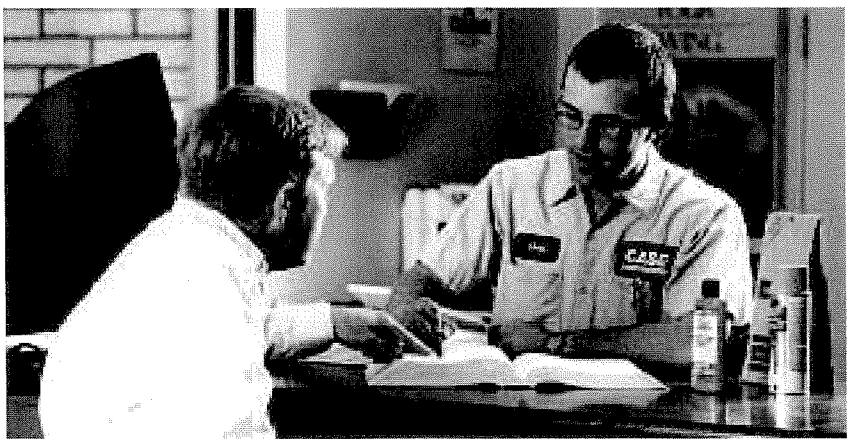
- Work faster and extend equipment life.
- Increase machine utilization.
- Increase your capabilities.

Let your Case dealer service your machine on the jobsite, so you'll be back on the job faster. Advantages include...

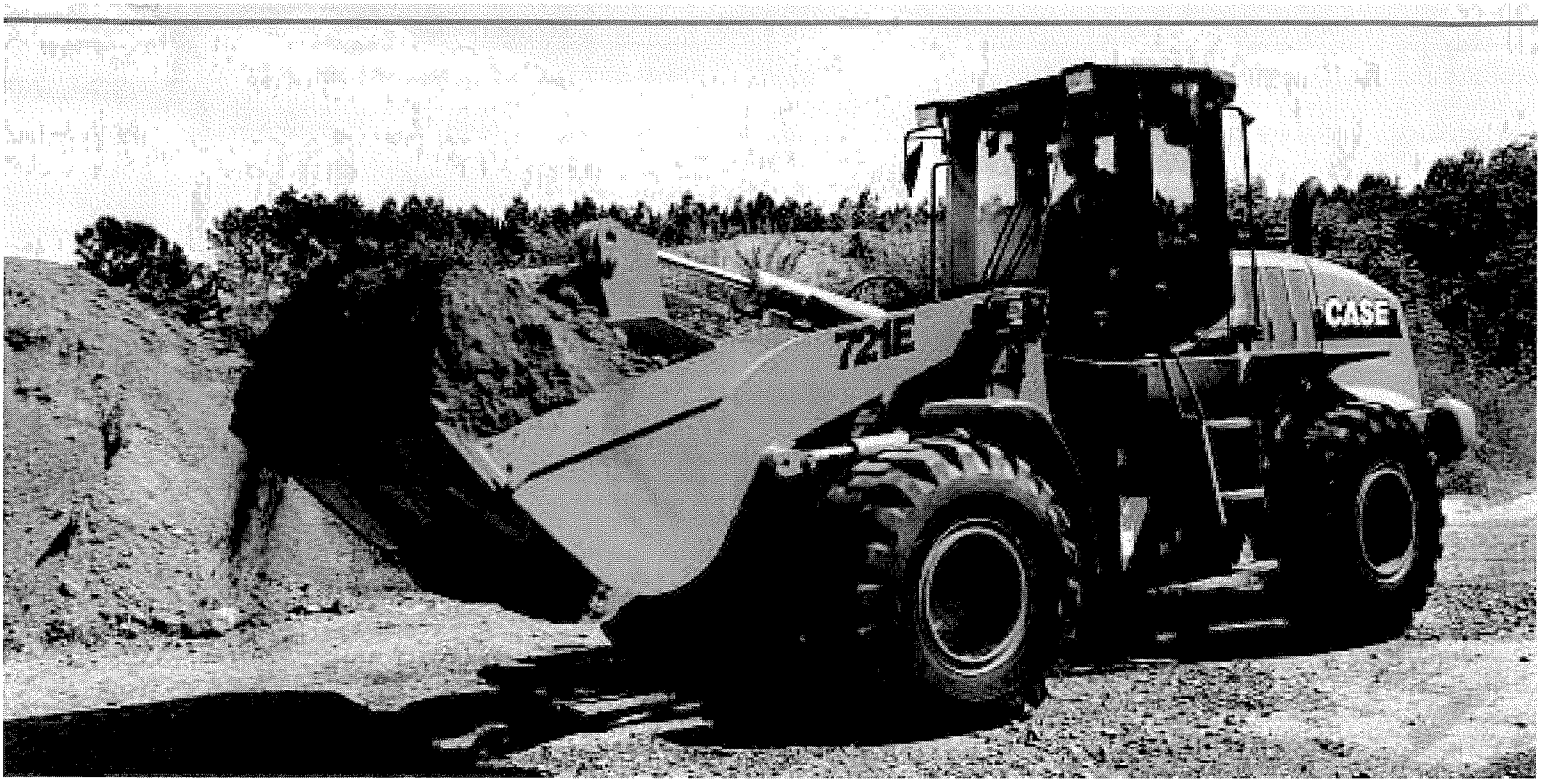
- Responsive jobsite service to keep your equipment running.
- Increase machine uptime.
- Certified service staff and improved parts availability.

Manage your equipment better. Case Care℠ is a prepaid maintenance plan designed especially for your machine. Factory-trained Case technicians perform routine inspections and regular service to prevent problems. Other options, such as the Machine Protection Plan℠, can be purchased to extend protection beyond the base warranty. Add the GlobalTRACS® Fleet Management Communications System to give you the information to better manage your fleet while protecting it against theft.

Ask your local Case dealer about adding value to your machine and peace of mind to your workday with these helpful products.



Case technicians have access to the latest diagnostic service tools.



Dependable Case wheel loaders are the machines of choice for contractors engaged in commercial or residential construction, road building, site prep, aggregate, sewer, water and utility work.

YOU DESERVE THE BEST - CASE DELIVERS

Superior productivity, efficiency, comfort and serviceability

Our ergonomically designed cab provides operator comfort for increased productivity. The enhanced Tier III-certified power moves more material per hour. Extra work modes match the machine operation to the task at hand for lower operating costs and increased productivity. Best-in-class maintainability means easy daily service. The easier service is to perform, the more likely it will get done.

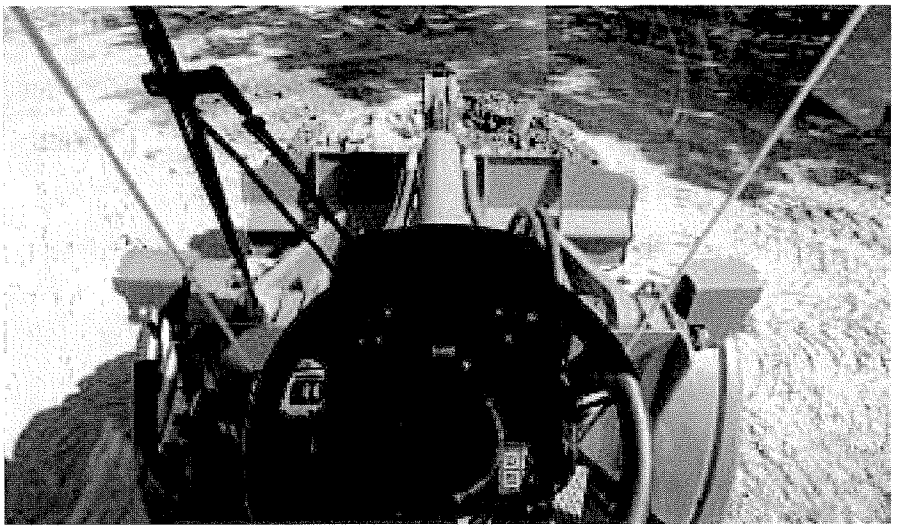
Challenging wheel loader applications require stability, superior traction, push power, lift capacity and quiet, fuel-efficient operation.

The E Series wheel loaders are loaded with innovative features and backed by Case durability and customer support.

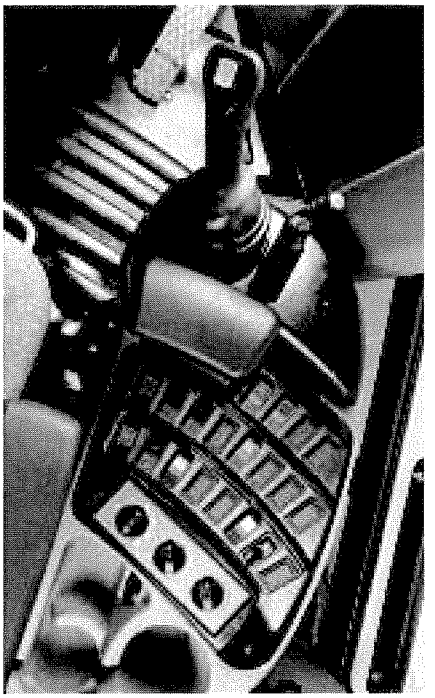
Spacious cabs provide comfort, visibility and an all-around command of the work site. Robust horsepower and pressure-compensating hydraulics deliver superior breakout force and lift capacity. Industry-leading ease of maintenance assures maximum uptime. The Case-exclusive mid-mount cooling module makes these wheel loaders fuel efficient and reliable for years to come, even in the dustiest environments.

Rugged E Series wheel loaders redefine productivity.

NEWLY DESIGNED CAB



An unobstructed view to the console's analog gauges and indicator lights keeps you informed of critical machine functions.



The spacious cab matches the machine to the operator through adjustable controls and easy-to-reach switch locations.

Power, utility, comfort and visibility

The large, roomy cab on the Case E Series wheel loader was designed with productivity and operator comfort in mind.

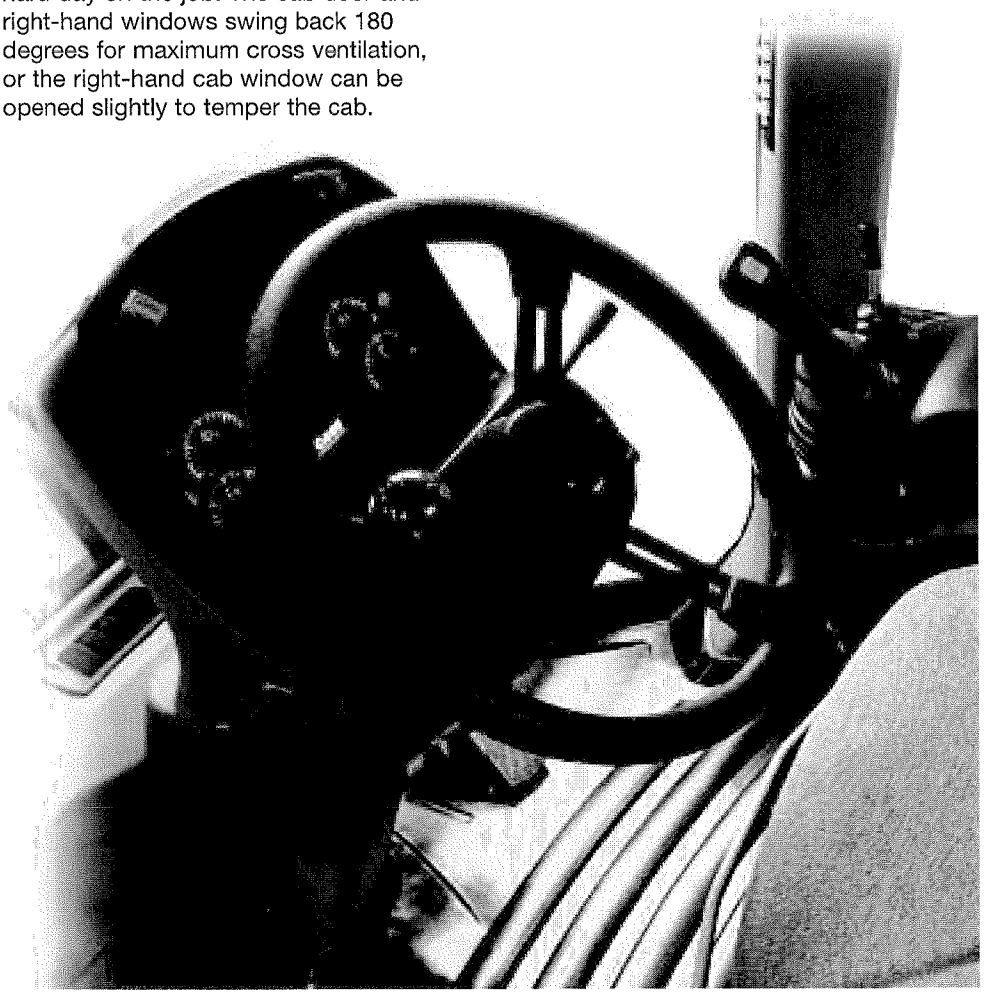
Case designed the E Series cab to match the machine environment to the operator. The adjustable tilt steering column, infinitely adjustable seat with arm rests and additional interior cab space maximizes operator comfort and productivity.

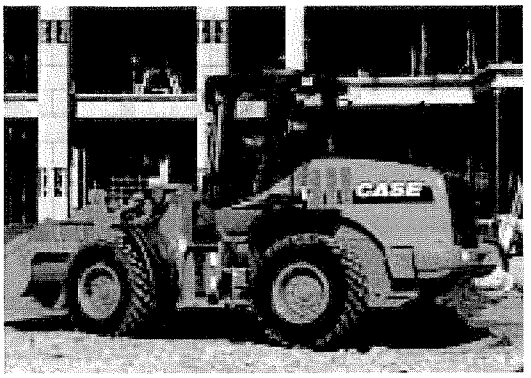
The iso-mounted cab features numerous air diffusers to provide maximum air circulation for faster, more thorough heating and cooling. Floor-to-ceiling glass in the front, along with a sloping rear engine compartment, offers a panoramic view for maximum visibility both forward and to the rear. The clear, direct view to the front tires, bucket edge and work site provides a more safe, productive and efficient operation.

The standard single-lever loader control with a forward-neutral-reverse switch and transmission downshift button puts all the controls at your fingertips. A digital display records real-time data, shows diagnostic information and allows programming of operational modes.

The in-cab thermal box keeps food and drink hot or cold during a long, hard day on the job. The cab door and right-hand windows swing back 180 degrees for maximum cross ventilation, or the right-hand cab window can be opened slightly to temper the cab.

And then there's the most comfortable feature of all—knowing your new wheel loader is supported by Case and your local Case dealer.





Retain more material

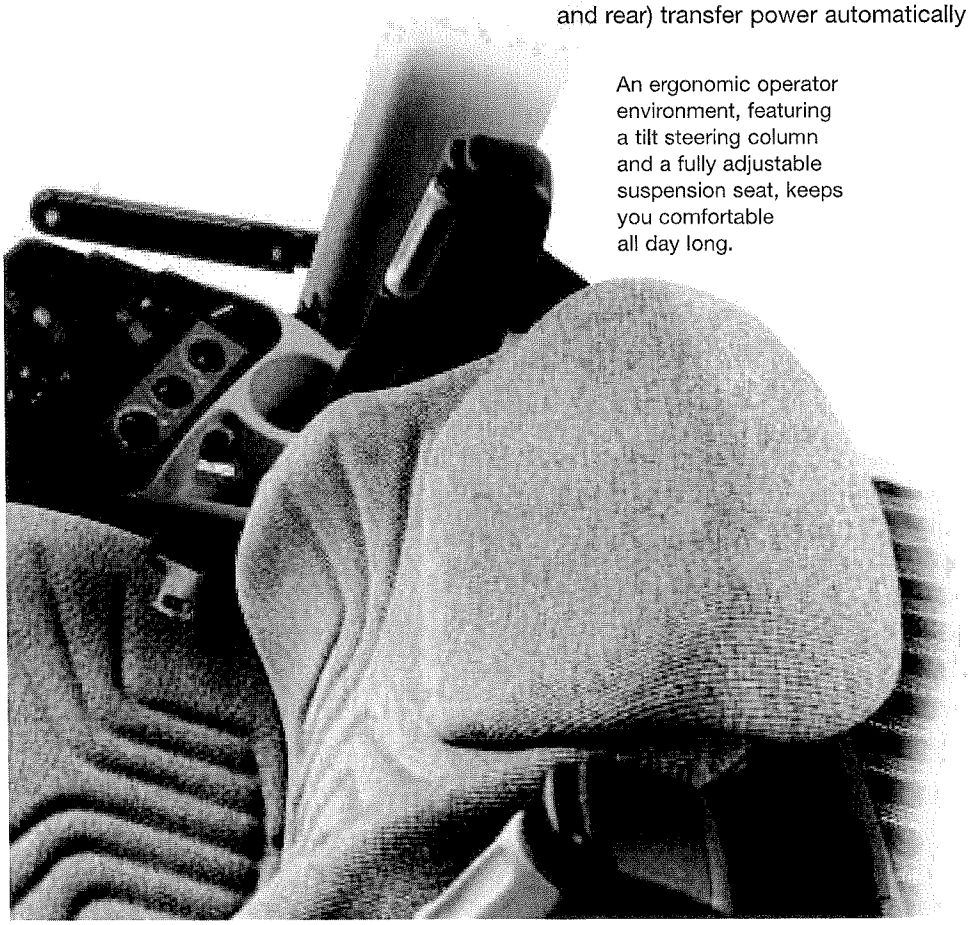
Optional Ride Control™ provides greater material retention while reducing shock loads both to the operator and the machine, even over rough terrain. The loader arms work as shock absorbers to cushion the bucket and maintain a full load. Ride Control can be used full time, for cushioning when transporting material up an incline. It can also be programmed to automatically engage any time.

E Series buckets feature an extended bolt-on cutting edge for easier penetration into the pile. The hinge pins are raised up out of the dirt and debris for longer life.

Dual limited-slip axles deliver more traction, less wear

Case wheel loaders deliver the superior traction needed to work efficiently in changing jobsite conditions. Unlike competitive models, limited-slip axles are standard Case equipment. These superior axles (front and rear) transfer power automatically from the wheel that is slipping to the wheel that is gripping. This reduces tire wear and maximizes tractive effort into the pile. This helps move more material per gallon of fuel and reduce tire replacement costs.

Outboard planetary and wet-disc brakes provide ease of serviceability because they are positioned outside the loader frame at the wheel end. With the weight of the planetaries outside the machine, operator comfort is increased through a smoother, more stable ride.



An ergonomic operator environment, featuring a tilt steering column and a fully adjustable suspension seat, keeps you comfortable all day long.

Fill your bucket faster

The new Case bucket increases productivity and provides longer wear. The bolt-on cutting edge was extended forward for rapid and easy penetration into the pile. The bottom floor plate of the bucket has been set on a five-degree angle for easy transition of material to the back curvature of the bucket. This allows for the material to mix easily, so you'll fill your bucket rapidly and provide more heaped bucket capacities. By filling your bucket faster, you'll move more tons per hour.

The skid plates are bolted on for easier repair and replacement. The hinge pins are raised up out of the dirt and debris for longer life, but also to allow the bolt-on cutting edge to continue cutting through the pile as the bucket is being curled, enabling complete bucket fills.

E Series

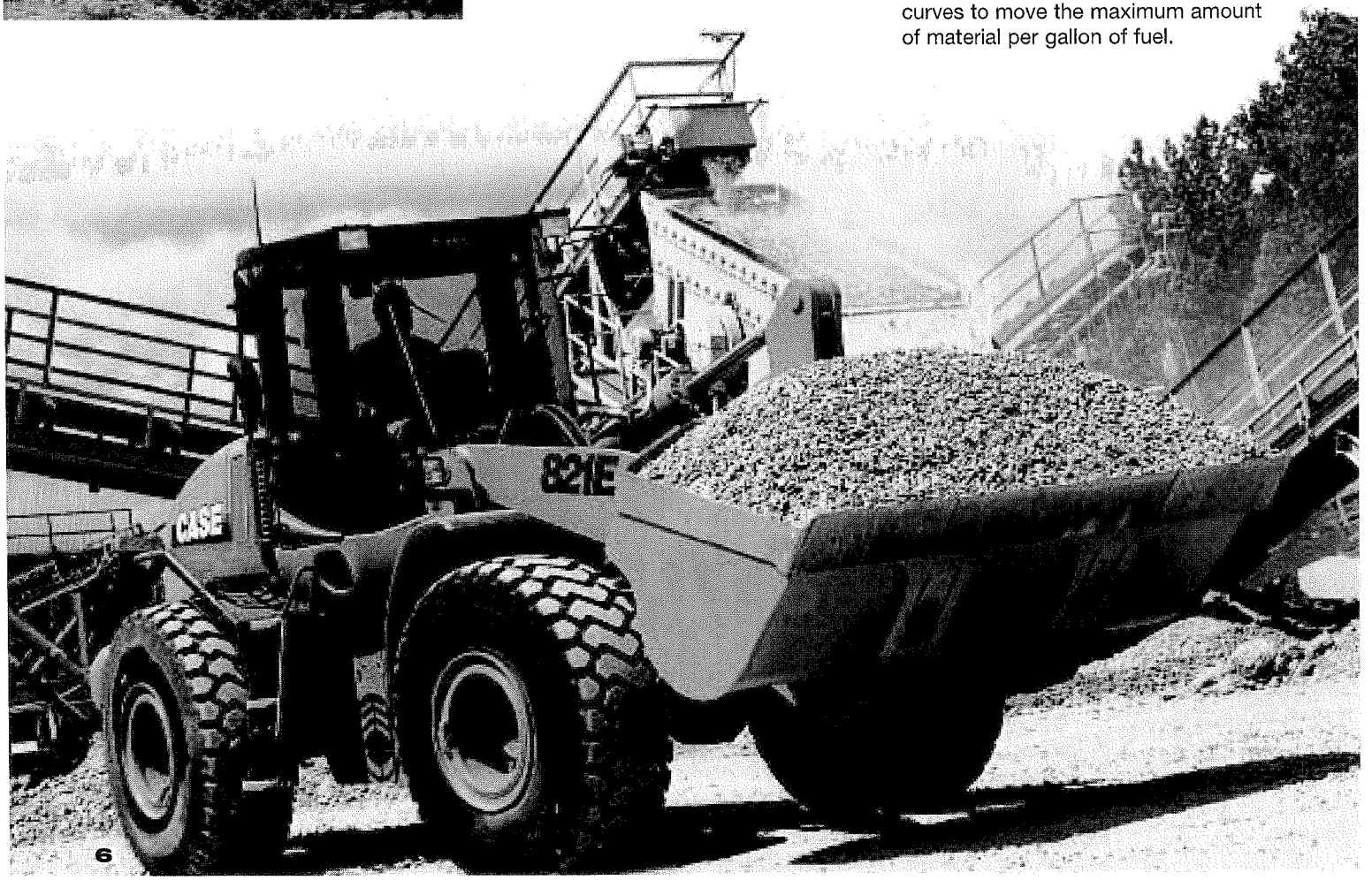
ENHANCED TIER III-CERTIFIED POWER

Case engines deliver power and fuel economy

Case E Series wheel loaders are powered by fully electronic, Tier III-certified Case engines that allow you to match power and fuel economy to your specific application. The engine incorporates the new electronic common-rail fuel injection system, which allows high-pressure fuel and air to mix thoroughly for a cleaner, more efficient combustion.

Three power curves and four work modes

Choose between three power curves—max, standard and economy power—and four work modes—max, standard, economy and auto. For high-production activities such as excavating operations that require high breakout force and maximum power to the wheels, you can choose to use maximum power at all times. For operations such as working in a pipe yard, handling pallets or moving light material, economy mode will complete the task with the greatest fuel efficiency. In auto mode, the electronically controlled engine automatically adjusts between power curves to move the maximum amount of material per gallon of fuel.



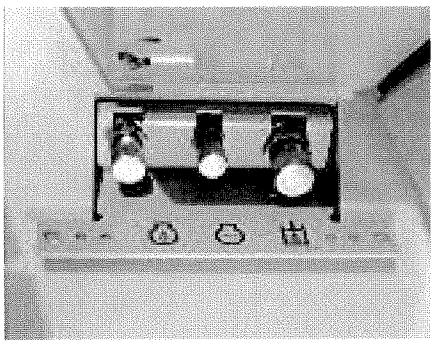
BEST-IN-CLASS MAINTAINABILITY

More uptime

Easy servicing extends machine life, lowers ownership costs and increases resale value. The easier it is to perform daily maintenance and service, the more likely it is going to be done correctly and on time—which is why Case designed the E Series wheel loaders with best-in-class maintainability.

The only tool required for daily maintenance checks is a rag to wipe oil off the dipstick.

Get your day off to a fast and productive start with easy-to-reach daily service checkpoints. The one-piece rear hood provides easy, ground-line access to the engine and all daily maintenance checkpoints. Fluid sight gauges are positioned at eye level. Three remote drains for coolant, engine and hydraulic oil provide convenient access for fast, environmentally friendly fluid changes.

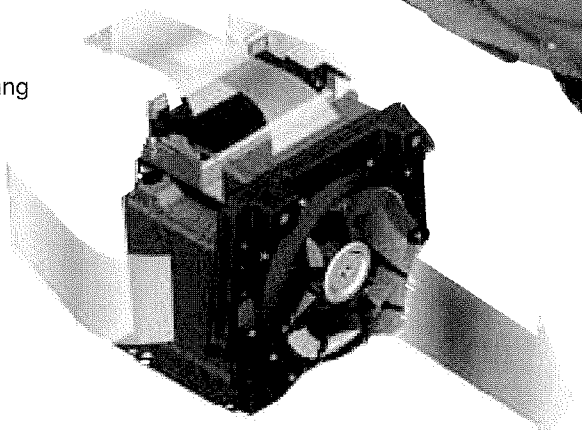


Keeping your Case wheel loader in top running shape requires less effort, so you can get back to the jobsite.

The electrically actuated rear hood provides complete access to the engine and daily maintenance checks.

Mid-mount cooling module

The Case-exclusive cube-shaped mid-mount cooling module supplies clean, ambient air to all coolers, increasing cooling efficiency, reducing fluid breakdown and extending component life. With no stacked coolers, the mid-mount cooling module prevents debris from plugging between coolers. An optional temperature-controlled fan within the cooling module can be reversed to purge debris from the module within seconds. This means the machine can remain on the jobsite rather than being moved to a cleaning station.



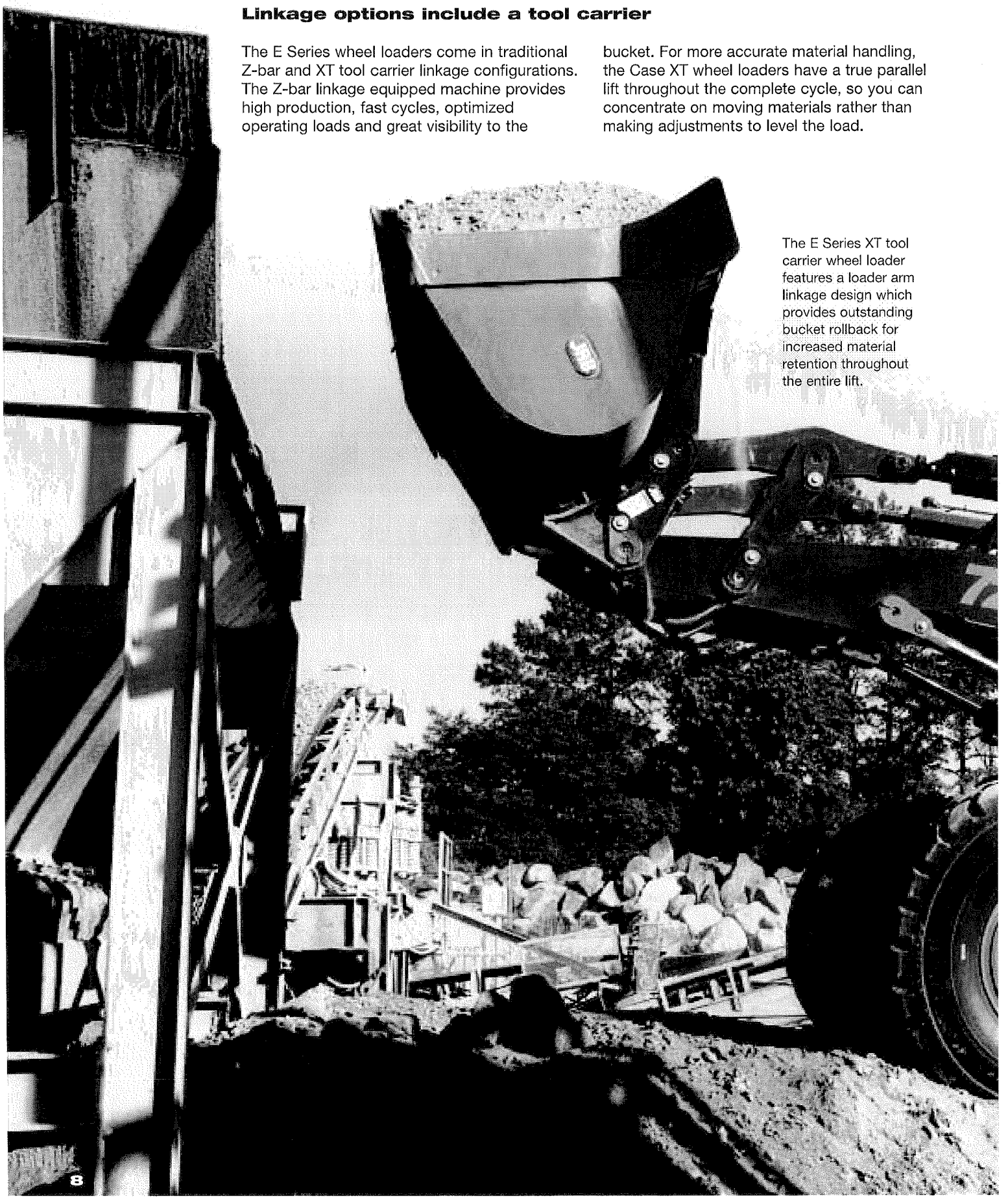
Material is removed from the cooling module by reversing the fan direction with a switch located in the cab.

E Series

521E/XT/XR, 621E/XT/XR, 721E/XT/XR AND 821E/XR

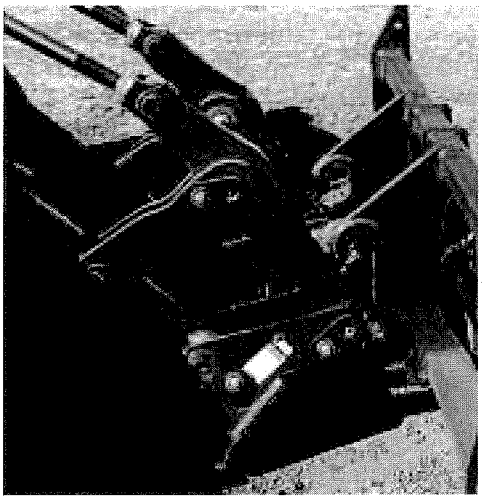
Linkage options include a tool carrier

The E Series wheel loaders come in traditional Z-bar and XT tool carrier linkage configurations. The Z-bar linkage equipped machine provides high production, fast cycles, optimized operating loads and great visibility to the bucket. For more accurate material handling, the Case XT wheel loaders have a true parallel lift throughout the complete cycle, so you can concentrate on moving materials rather than making adjustments to level the load.



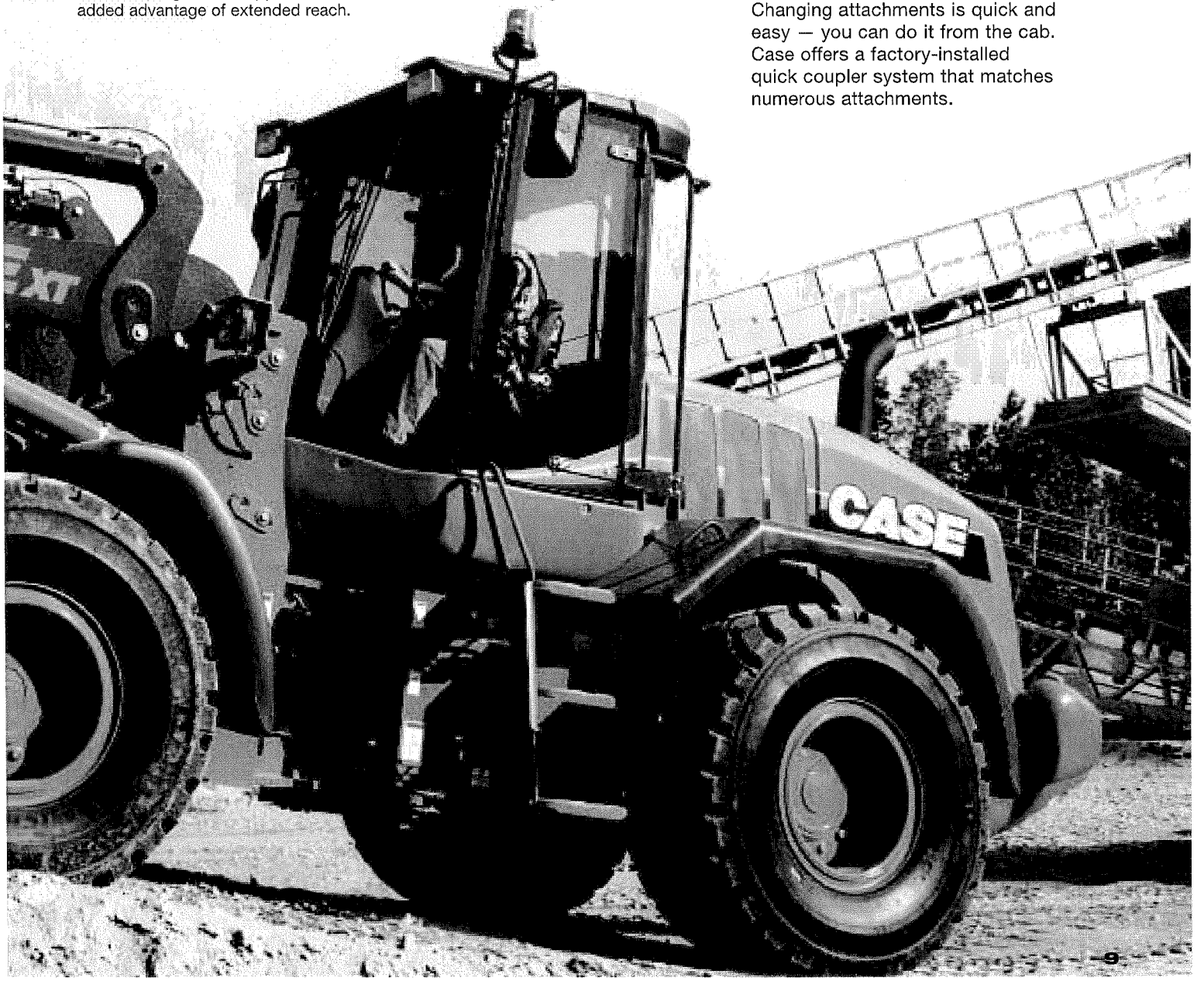
The E Series XT tool carrier wheel loader features a loader arm linkage design which provides outstanding bucket rollback for increased material retention throughout the entire lift.

The XR configuration supplies all the benefits of the Z-bar configuration but with an added advantage of extended reach.



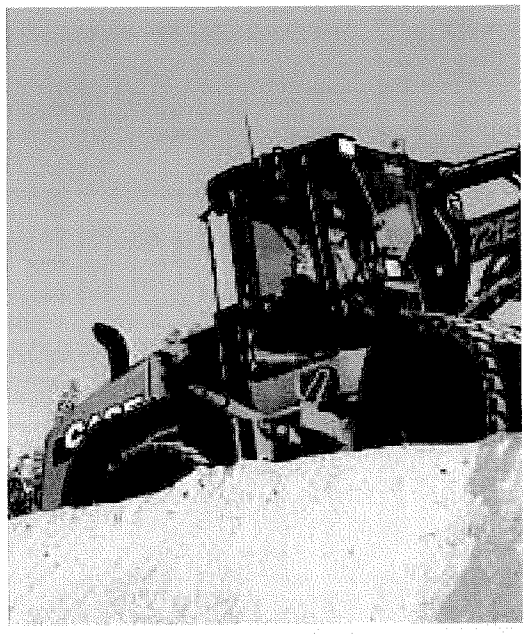
Hydraulic quick couplers

For maximum versatility with multiple attachments, Case wheel loaders can be equipped with a hydraulic coupler. Changing attachments is quick and easy — you can do it from the cab. Case offers a factory-installed quick coupler system that matches numerous attachments.



E Series

BUCKETS AND ATTACHMENTS



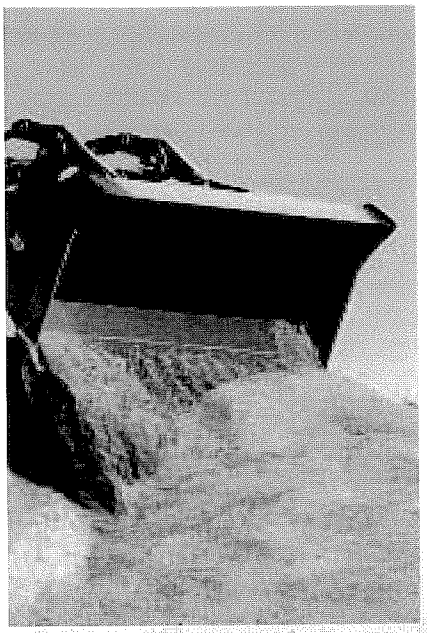
Get more out of your machine

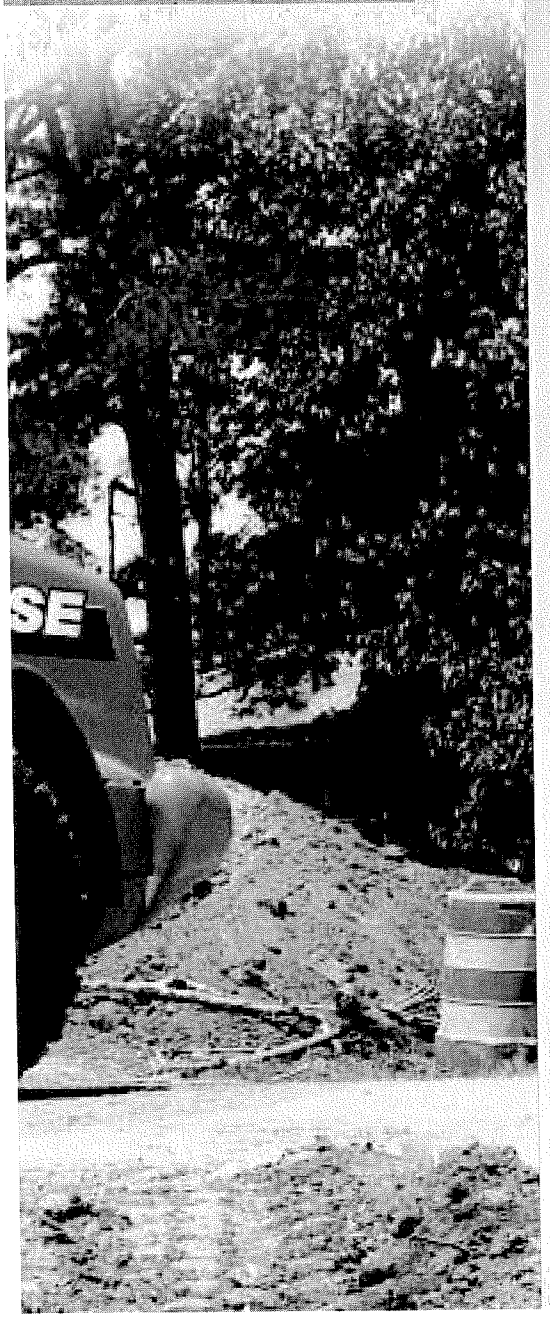
Whether you're loading dirt, moving pallets, digging holes or cleaning the jobsite, the increased attachment work range of Case wheel loaders improves machine versatility.

For fast, easy attachment changes, the optional hydraulic quick coupler lets you quickly connect and release attachments from the seat of the cab, saving time and boosting productivity.

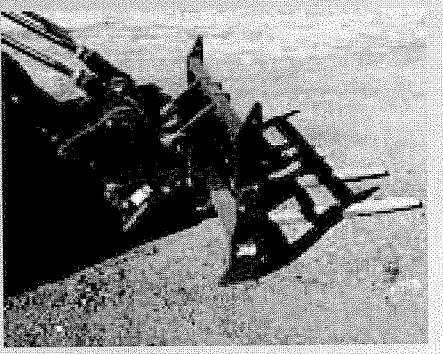
The excellent visibility to the coupler latching pins helps to quickly align attachments for faster hook-ups. With a Case E Series wheel loader, you can work with a variety of attachments, including general-purpose buckets, 4-in-1 buckets, pallet forks, snow blades, angle brooms, augers, scrap grapple buckets, jib booms and more.

Ask your Case dealer about our full line of attachments.



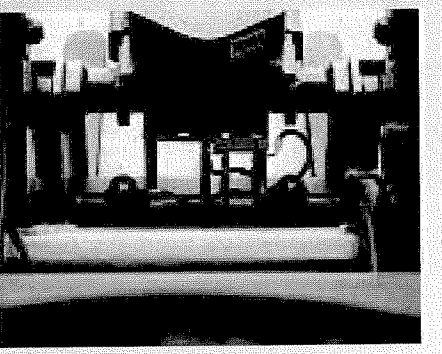


GET MORE OUT OF YOUR MACHINE WITH ATTACHMENTS



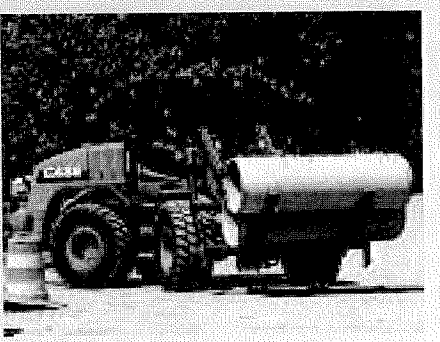
Hydraulic quick coupler

For quick and easy attachment changes, the optional hydraulic quick coupler saves time and boosts productivity.



Visibility to the pins

Excellent visibility to the hydraulic quick coupler pins assist in quickly aligning attachments for faster hook-ups as well as providing a clear view to the attachment.

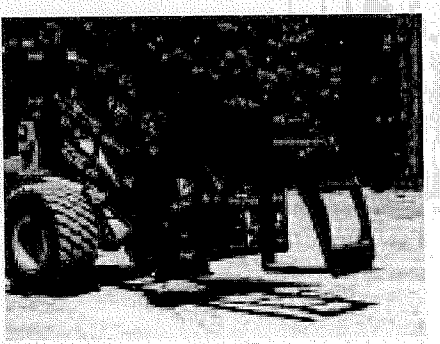


Forks

General purpose buckets

Jib booms

4-in-1 buckets



Grapple/fork

Side dump bucket

E SERIES WHEEL LOADERS
QUICK SPECS

521E	Z BAR	XT	XR
Engine	135 net hp (101 kW)	135 net hp (101 kW)	135 net hp (101 kW)
Operating weight	23,069 lb (10 464 kg)	26,861 lb (12 184 kg)	23,442 lb (10 633 kg)
Max bucket capacity	2.6 cu yd (2.0 cu m)	2.1 cu yd (1.6 cu m)	2.6 cu yd (2.0 cu m)
Operating load	8,116 lb (3681 kg)	6,648 lb (3016 kg)	6,862 lb (3112 kg)
Breakout force	20,926 lb (9492 kg)	25,194 lb (11 428 kg)	23,463 lb (10 642 kg)

621E	Z BAR	XT	XR
Engine	162 net hp (121 kW)	162 net hp (121 kW)	162 net hp (121 kW)
Operating weight	27,406 lb (12 431 kg)	28,709 lb (13 022 kg)	27,604 lb (12 541 kg)
Max bucket capacity	3.0 cu yd (2.3 cu m)	3.0 cu yd (2.3 cu m)	3.0 cu yd (2.3 cu m)
Operating load	10,190 lb (4622 kg)	8,553 lb (3879 kg)	8,309 lb (3769 kg)
Breakout force	26,577 lb (12 055 kg)	26,756 lb (12 137 kg)	27,375 lb (12 417 kg)

721E	Z BAR	XT	XR
Engine	183 net hp (137 kW)	183 net hp (137 kW)	183 net hp (137 kW)
Operating weight	30,644 lb (13 900 kg)	31,827 lb (14 436 kg)	31,852 lb (14 448 kg)
Max bucket capacity	3.5 cu yd (2.7 cu m)	3.0 cu yd (2.3 cu m)	3.25 cu yd (2.5 cu m)
Operating load	12,067 lb (5474 kg)	11,565 lb (5246 kg)	9,836 lb (4461 kg)
Breakout force	32,958 lb (14 950 kg)	28,770 lb (13 050 kg)	32,778 lb (14 868 kg)

821E	Z BAR	XR
Engine	213 net hp (159 kW)	213 net hp (159 kW)
Operating weight	37,844 lb (17 166 kg)	39,045 lb (17 710 kg)
Max bucket capacity	4.5 cu yd (3.4 cu m)	4.5 cu yd (3.4 cu m)
Operating load	13,932 lb (6320 kg)	10,934 lb (4960 kg)
Breakout force	40,738 lb (18 479 kg)	41,369 lb (18 765 kg)

NOTE: All engines meet current EPA emission regulations.

NOTE: All specifications are stated in accordance with SAE Standards or Recommended Practices, where applicable.

IMPORTANT: Case Construction Equipment Inc. reserves the right to change these specifications without notice and without incurring any obligation relating to such change. Availability of some models and equipment builds vary according to the country in which the equipment is used. The illustrations and text may include optional equipment and accessories and may not include all standard equipment. Your Case dealer/distributor will be able to give you details of the products and their specifications available in your area.

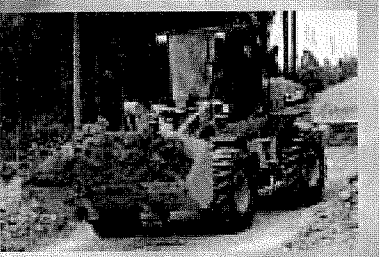
SAFETY™ NEVER HURTS

Always read the Operator's Manual before operating any equipment. Inspect equipment before using it, and be sure it is operating properly. Follow the product safety signs and use any safety features provided.

Contains 10% Post-Consumer Fiber

521E

621E



721E

821E

Looking for product specs, customer testimonials, competitive comparisons, finance offers and more?
Visit us at www.casece.com

Form No. CCE1100805
Replaces Form No. CCE8100701

CASE CONSTRUCTION

Wildcat

Towable Straddle Compost Turner

Turns a 5' high x 14' wide windrow in a single pass!

SPECIFICATIONS

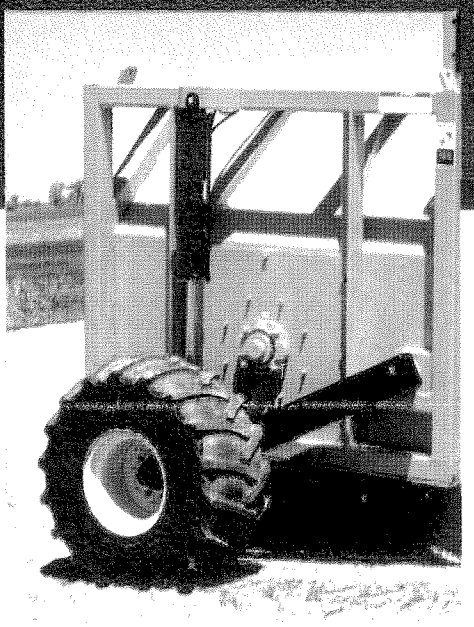
- 5' x 14' windrow capacity (single pass).
- Capacity: 2,300 tons per hour.
- 170 HP diesel engine.
- Windrow over 5,400 cubic yards per acre.
- Enclosed engine compartment helps keep radiator clear.
- Heavy-duty construction will provide years of reliable service.
- Fully mixes and completely aerates the windrow.
- Hitch folds hydraulically for ease of transport.
- Work platform around engine enclosure allows ease of maintenance.
- 4" x 12" flails, the heaviest on the market.
- Frame is heavy-duty 4" x 4" x ¼" structural tube.
- Weight: 13,200 lbs.
- 38" diameter drum (including flails) for increased tip speed.
- Can be towed with any 60 HP tractor.
- All functions are easily operated from control panel mounted on prime mover.
- One year parts and labor warranty.

No Creeper Gear Required!

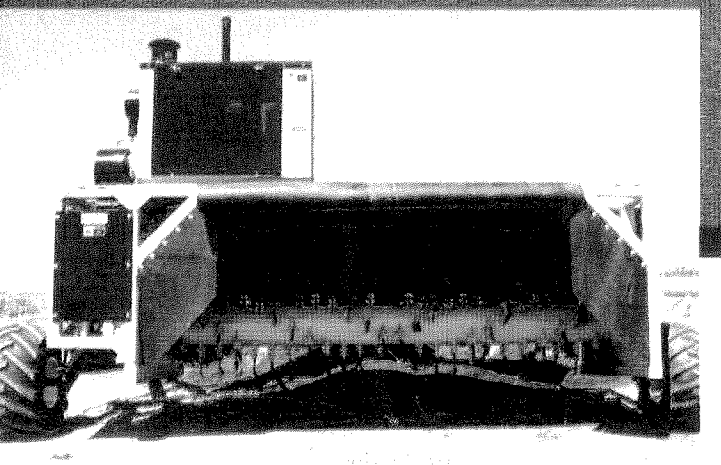
Wildcat, the world's largest compost turner manufacturer.

Features

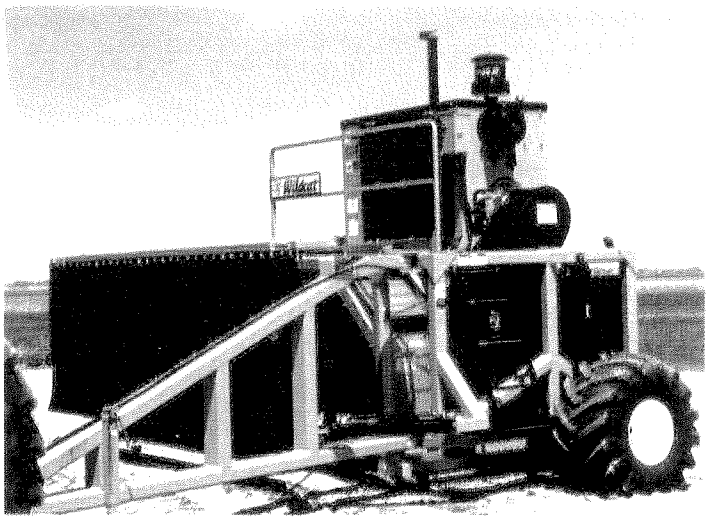
- All control functions are operated from the drivers seat.
- Control panel is illuminated for night operation.
- Minimum 60 horsepower tractor (no creeper gear required).
- Belt and roller chain drive system for ease of maintenance.
- All roller chains are enclosed in an oil bath reservoir.
- No complex hydraulics or expensive gearboxes.



On the Wildcat TS514, the vertical adjustment on each side of the compost turner can be individually adjusted up to 24 inches. This allows the compost turner to adapt to site conditions that previously have been unsuited for the majority of towable machines.



The aggressive Wildcat flails assure full windrow aeration.



Hitch folds hydraulically for ease of transport.

Wildcat Manufacturing, the proven leader...we've been turning the heads of microbes around the world for over 25 years!

Wildcat

Box 1100, Freeman, South Dakota 57029 USA
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